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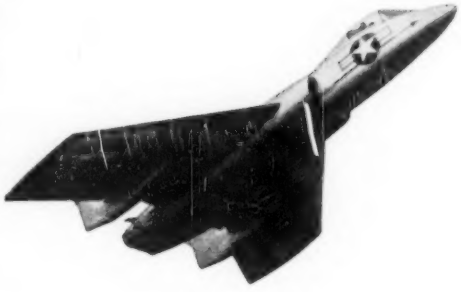

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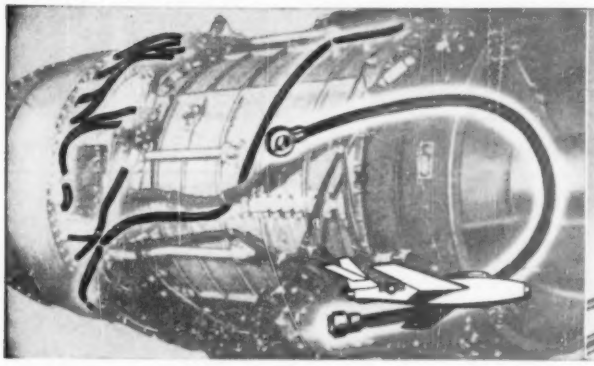

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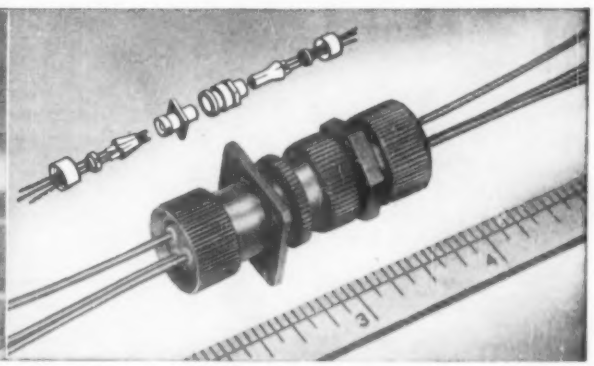

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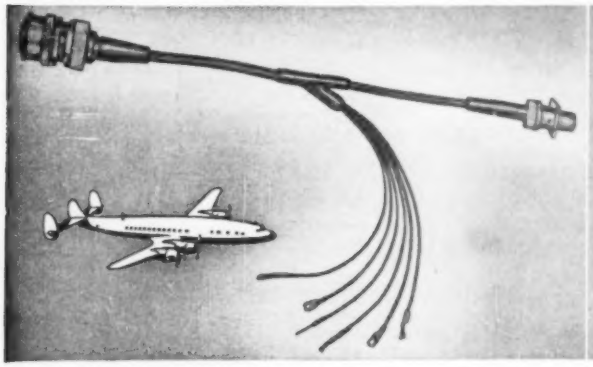

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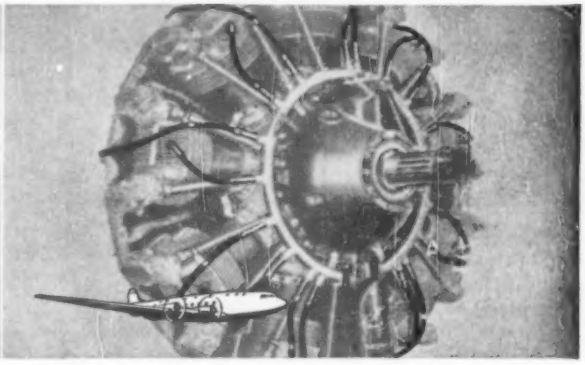

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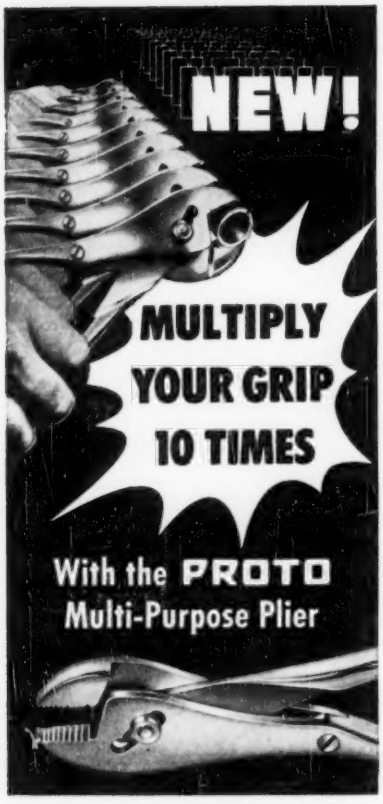

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Aviation Week

January 4, 1954 Vol. 60, No. 1

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Table of Contents on Page 8

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North American Aviation

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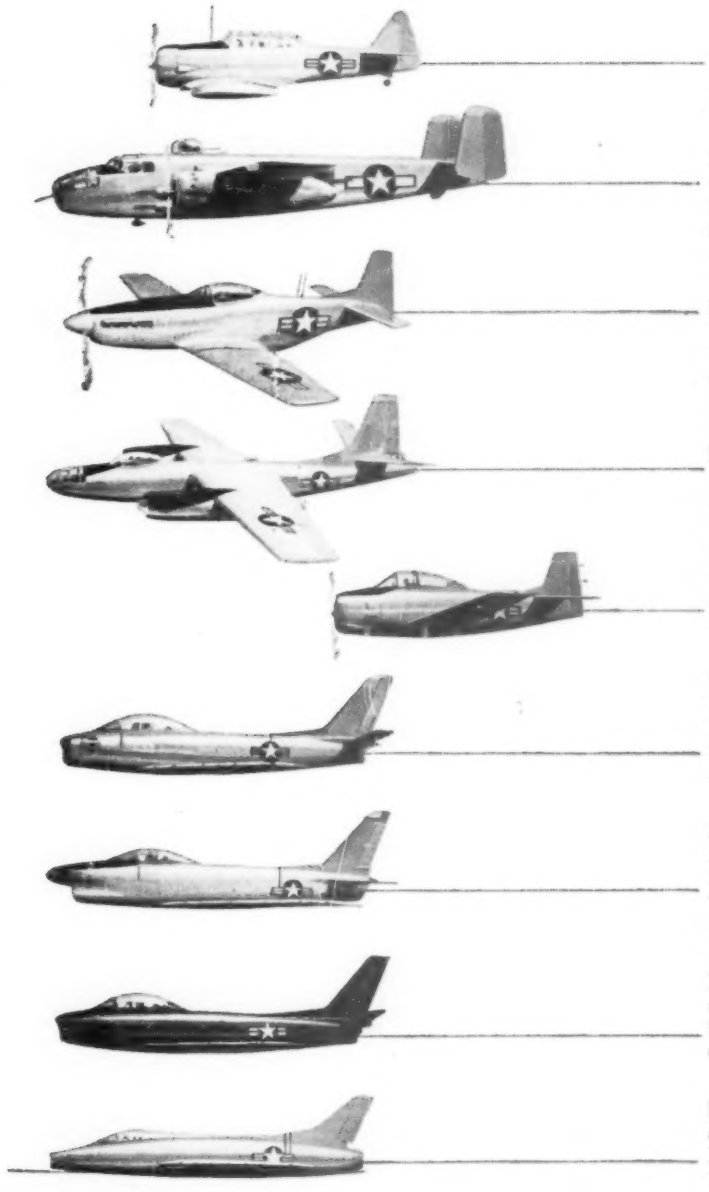

T-6 Advanced Trainer – Used by 33 Allied Nations in W. W. II. Provided close tactical ground support in Korea.

B-25 Mitchell Bomber – Served in all theaters in W. W. II in several different bombing capacities... including famous first bombing of Japan. Rugged, practical, heavily armed.

P-51 Mustang – Leading fighter of W. W. II. Served as photographer, dive bomber, strafer, escort, spotter, for close ground support. Held line in Korea before *Sabres* arrived.

B-45 Tornado – First operational multi-jet airplane to fly in the U. S. First to fly non-stop across the Pacific.

T-28 Trainer – Faster than many W. W. II fighters with top speed of 346 MPH. 1,000 already delivered to Air Force. Now being delivered to Navy.

F-86 *Sabre* Jet – News making king of MiG Alley with kill ratio of 12 to 1 over MiGs. Produced in Australia and Canada and in Italy for NATO. Acclaimed as best all 'round fighter in the world.

F-86D *Sabre* Jet – America's only one-man, all-weather interceptor. Rocket firing. Now operational as primary continental defender... with 700 MPH *plus* speed.

FJ-3 Fury Jet – Latest of North American's FJ Series of Navy carrier-based fighters. With faster speed and rate of climb and superior firepower.

F-100 *Super Sabre* – Tri-sonic performance with overall weapon effectiveness. Now in production for Air Force. Flies faster than speed of sound in level flight.

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Record breaking Jet Pilot says, "I sure got a boot when I turned that afterburner on!"

LT. CDR. JAMES B. VERDIN flew the Navy's F4D Skyray to a world speed record of 753.4 mph on October 3, 1953. The Skyray, designed and built by Douglas Aircraft Company, used a Westinghouse J40 jet engine plus Afterburner.

PILOTS HERE AND ABROAD join in giving the Afterburner credit for making possible new jet plane speed records. Afterburners provide great boosts in power with little added weight and drag, by burning fuel in the jet engine's exhaust stream. Pioneered by Solar*, Afterburners are also made by other companies, for maximum production for National Defense.

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NEWS DIGEST

Convair Launches First Production Tradewind

Turboprop-powered Convair R3Y-1 Tradewind flying boat in the water following launching from company's ramp on the edge of San Diego Bay (Aviation Week Dec. 28, p. 18). It is the first of a number of Tradewinds being produced for the Navy. The 80-ton Allison-powered freight and personnel transport has a top speed of more than 350 mph. It is derived from the XP5Y-1 prototype and features numerous improvements over this earlier type, including more streamlined, shorter engine nacelles and new bracing arrangement for wingtip floats, which formerly used cantilever suspension. Navy will operate its Tradewind fleet out of Alameda, Calif.

Domestic

Frank J. Macklin, director of the military bureau of Air Traffic Conference of America since its inception, is new assistant vice president-traffic of Air Transport Assn. Macklin retains his previous duties in addition to further Air Traffic Conference responsibilities.

Howard Hughes has filed incorporation papers in Delaware for Hughes Aircraft Co. At midweek, company officials had not commented on the move.

W. A. Patterson, president of United Air Lines, has inspected Piasecki's YH-16 transporter 40-passenger USAF helicopter prototype now being tested at Philadelphia International Airport.

Six U.S. air carriers—Slick Airways, Flying Tiger Line, Seaboard & Western Airlines, Overseas National Airways, Transocean Air Lines and California Eastern Airways—have joined the International Federation of Independent Air Transport Operators. New members operate a total of 93 transports, increasing the FIATO fleet to 370.

Lightplane builders exported 30 aircraft valued at $359,976 during November, bringing overseas shipments for the first 11 months of 1953 to 538 units at $4,105,252, Aircraft Industries Assn. reports.

Four-year scholarships in the Lockheed Leadership Fund will be awarded in 1954 to 20 applicants.

Pan American World Airways has won Midwestern Travel Writers Assn.'s award for "best travel promotion in the world for 1953."

Business executives will be offered chartered or leased aircraft on a contract basis, according to plans of recently organized Buffalo (N. Y.) Air Transport.

Col. Willard W. Millikan, National Guard pilot, will try to set a new transcontinental speed record Jan. 4, flying an F-86 from Los Angeles to New York.

Financial

North American Aviation, Los Angeles, had net earnings of $12,773,361 during fiscal 1953, an increase of $4,952,475 over 1952. Sales totaled $636,537,658, more than double the previous year's $317,198,022. Backlog as of Sept. 30: $958 million. NAA does not expect the eight-week wage strike ordered by United Auto Workers (CIO) (AVIATION WEEK Dec. 21, p. 18) to reduce materially fiscal 1954 sales and earnings.

International

Grumman S2F twin-engine anti-submarine plane (picture, p. 15) will be built under license by de Havilland Aircraft of Canada at Toronto for the Royal Canadian Navy. Delivery of the planes is expected to begin early in 1956. They will replace the World War II Grumman TBF Avengers now used by RCN.

Six Douglas DC-6Bs have been purchased by three independent French airlines: two each going to Transports Ariens Intercontinentaux, Compagnie General Transport Aerien Air Algerie and Aigle Azur. Deliveries will start in the summer of 1955. TAI already has two DC-6Bs.

Aviateca C-46 crashed last month as it neared Guatemala City on a cargo flight from Brownsville, Tex., killing the pilot and co-pilot. The crash was the first fatal accident for the government-owned Guatemalan airline in more than 15 years of operation.

Aircraft assembly plant will be constructed by Mexico this year. The factory is among several projects planned by the government to encourage civil aviation.

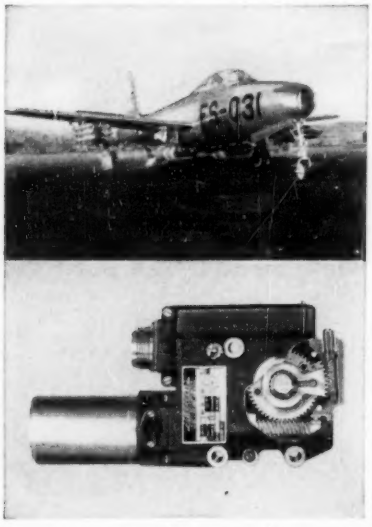
Hunting Air Transport has changed its name to Hunting-Clan Air Transport, bringing into effect a partnership between the independent British airline and Clan Line steamers.

New Austrian airline is taking preliminary shape at Vienna through efforts of the Viennese Airport Operating Co., Ltd., founded to pave the way for Austria's first postwar civil air carrier.

Japan's Kawasaki Gifu Works (wartime Kawasaki Aircraft Co.) is negotiating with Lockheed for a license to repair and produce jet planes.

Two Bell 47G helicopters are scheduled to go into service with Royal Norwegian Air Force early next year, increasing the country's fleet of U. S.-built copters to eight.

Jato Release on Republic's F-84 AIRBORNE Actuated



The R-424 actuator (R-450 type) jettisons six Jato bottles after take off. The R-424 winds cables on a drum and pulls the pins.

This cutaway of Airborne's Model R-450 actuator shows the externally adjustable positive stops which, in conjunction with torque-limiting switches, provide accurate positioning at both extremes of travel. The limit may be at any value to 270°.

Projection of the splined output shaft, on both sides of the actuator, helps adapt the model R-450 to any application. The weight of this unit, with radio noise filter, is 2.7 pounds—the speed, at 26 volts and 250 pound-inch load, is 5 rpm.

See our insert in the I.A.S. Aeronautical Engineering Catalog for details on this and other Airborne actuators.

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The Aviation Week

January 4, 1954

Headline News

AIA '54 Sales Forecast: $9 Billion..... 13
AF Settles on $13-Billion Budget..... 14
Piasecki Opens H-21C Breakup Study.. 15
Short to Help Build Bristol Britannia.. 15
DMB Plans Titanium Buildup..... 16
Jet Liners Will Be Easy to Fly: Pilot.. 16
Air Buildup Industry's Task: Peale ... 16
Market Research Business Plane Key.. 17
Airline Hostesses: 32 Too Old?..... 18
Convair, IAM Reach Agreement..... 22
Civil Plane Shipments Drop 14%..... 25

•

Production Engineering

Martin Boosts Canberra Performance.. 28
High-Aspect-Ratio H.D. 32 Details..... 46
Tax Aid for Engine Plant Expansions.. 47

•

Avionics

Transistor Easy to Mass Produce..... 50
Tiny Devices Cut Avionics Load..... 52

•

Equipment

X-3 Cooling System Small, Powerful... 56

•

Air Transport

CAB Rejects Interchange Plan..... 67
Board Joins P.O. on Mail Pay Cuts.... 67
U.S. to Continue Weather Ship Aid.... 68
N.Y. Airports Get Weather Aids..... 68
Flag Line Profits Lead Industry..... 68
TAC Reveals AF Supply Routes..... 70
CAB Limits Mail Airlift to Skeds..... 71

•

Editorial

Airports vs. Property Values.. 82

•

Departments

News Digest 7
Picture Page 9
Who's Where 11
Industry Observer 11
Washington Roundup 12
News Sidelights 21
Filter Center 53
New Aviation Products..... 60
CAB Orders 72
Shortlines 80
Aviation Calendar 80

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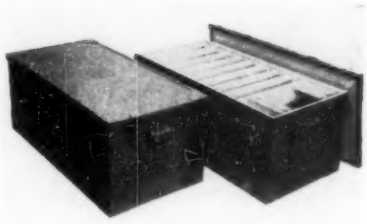

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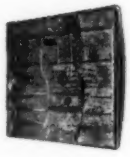

Cargo Hatch, one of 23 products manufactured by REF for Grumman's "Albatross" Rescue Ship and "Cougar" Jets.

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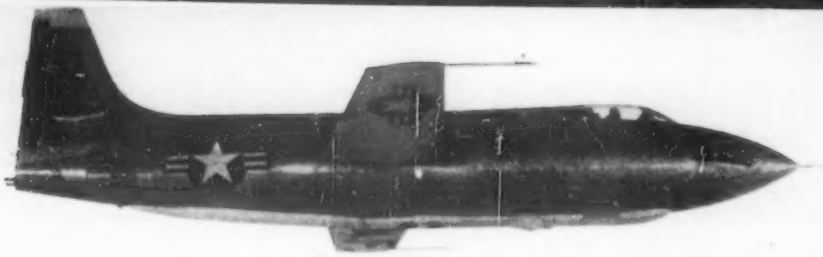
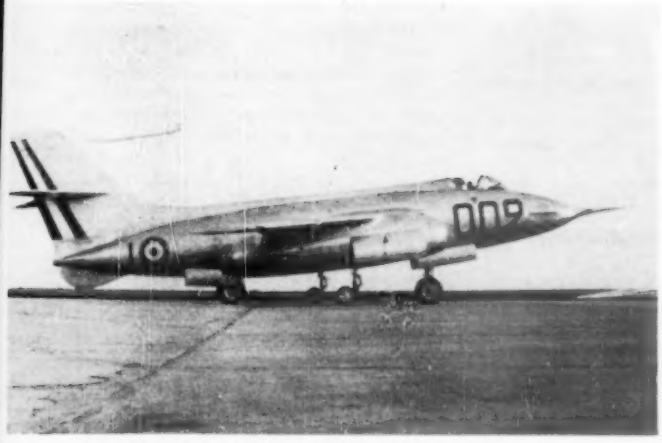


PRESENT AND FUTURE—North American F-86D Sabre jet fighter accompanies new Bell X-1A rocket-powered research plane that USAF Maj. Charles Yeager flew at more than 1,600 mph. (Aviation Week Dec. 28, p. 15). The Sabre typifies current in-service fighter design; X-1A is undergoing extensive flying to establish design criteria for future 1,000-mph.-plus military planes.

New Military Jets Try Their Wings Here and Abroad

FRENCH DELTA FIGHTER—Tests are being conducted on new lightweight all-wood Payen P.A. 49 fighter (above and below), powered by one 330-lb-thrust Turbomeca Palas (also see Aviation Week Aug. 3, p. 39). It is designed for a top speed of 250 mph.



FRENCH ATOM BOMBER—Claimed by its maker, Sncaso, to be capable of carrying an atomic weapon 1,242 mi., the S.O. 4050 is a single-seater second-prototype in this fighter-bomber series. Engines are 6,615- or 7,276-lb.-thrust Atar jets.

DELTA CLOSEUP—Canopy is positioned over the small cockpit of the P.A. 49 delta fighter. The plane spans approximately 17 ft. and is about 9 ft. long. Flight duration is estimated at 30 min. Wing has 70-deg. sweep, and aspect ratio is 2.7.

Remington Rand Methods News

Manufacturer Increases Typing Production 75% With Remington Electric Typewriters

This startling figure came right out of an efficiency report made by J. J. Nelson, Purchasing Agent at Southwest Airmotive. In his own words: *"With the new Remington, we can turn out 75% more purchase orders. There are 50% more inserts and 40% more information put on each purchase order. We have clearer copies with less chance for error..."* This vividly illustrates how Remington Electrics are handling the flood of paperwork which swamped SAC when sales jumped from half a million dollars to six million dollars.

Increased typing production followed immediately after Remington Electrics were installed because typing is so much easier. *Electricity does the work* ... controls the keyboard, shifts and carriage return. Typists turn out more and better work immediately.

United Airlines, Pioneer Airlines and Glenn L. Martin are just a few of the many other organizations which have discovered the economies of electric typing. Learn how you can obtain the same benefits. Get 16-page book, "Dividends of Electric Typing" **RE8612.**

More Plants Slashing Maintenance Costs, Keeping Production At Peak

New Booklet on Preventive Maintenance Gives Flow Chart for Effective Control

Are *more than* 5 out of every 100 of your production workers doing plant maintenance? That's what a recent survey of manufacturing plants in the U.S. established! Is it any wonder that the latest developments in Preventive Maintenance Records, displayed at the Plant Maintenance Show held in Chicago in January, attracted sensational interest?

If you missed that exhibit, send today for our new free booklet **X1383,** showing in detail just how a planned maintenance control system works ... how easy it is to install in your plant ... how it insures maximum equipment productivity at greatly reduced operating cost.

These methods visually indicate what inspections are needed ... permit scheduling of work ahead. Every man's time can be planned for maximum efficiency. Simplified visible methods provide tight control with paperwork streamlined to an absolute minimum.

The requirements of any such system are the same regardless of the size of the work force. They should include *all* of the following: 1) Written Work Orders 2) Scheduled Work 3) Equipment Records 4) Stores Control 5) Executive Reports.

Actually, maintenance management simply can't do a bang-up, cost-conscious job without a planned system with effective records providing all the facts for making sound decisions. The system offered in our booklet virtually gives you those facts at a glance!

Get this new booklet today. See illustrations and descriptions of basic records which well-known plants are successfully using to put their maintenance operation on the same efficient basis as other operating departments. Ask for **X1383.**

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Timken Roller Bearing Effects Big Savings Using Kard-a-Film For Personnel Records

Let this Certified Report written by an official of the Timken Company show you why personnel records need to be kept indefinitely ... how an ordinary file drawer which formerly held 3,000 to 4,000 letter size records, now holds 250,000 documents!

Further, how Kard-a-Film records filed under the Variadex system makes for such speed of filing and reference that Timken now actually locates a "dead" personnel record as easily and quickly as one in the active file!

Read how Timken first tried microfilm on conventional reels only to find these unsatisfactory for a personnel records file. Kard-a-Film holds microfilm records on cards—all grouped by a particular subject rather than isolated on a number of different microfilm spools. Documents no longer used can be kept up-to-date. Kard-a-Film Reader shows the records actual size right from the card and makes accurate inexpensive reproductions. Your personnel records are important to your company, your employees and others in your plant town get the benefit of Timken's experience. Get **CR867.**

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1-16

Profit-Building **IDEAS** For Business

WHO'S WHERE

In the Front Office

Robert H. Charles is new executive vice president of McDonnell Aircraft Corp., St. Louis.

D. W. H. MacKinnon has been elected vice president in charge of engineering and maintenance for Northeast Airlines.

L. L. Garber is a director, vice president and general manager of H. K. Porter Co.'s newly acquired division, Alloy Metal Wire Co. at Prospect Park, Pa.

Gen. Robert J. Smith, president of Pioneer Air Lines, has been reappointed a member and deputy chairman of the board of the 11th District of the Federal Reserve Bank.

William H. Moore, vice president of Bankers Trust Co., has been elected to the board of Republic Aviation Corp., Farmingdale, N. Y.

Thomas S. Nichols, president of Mathieson Chemical Corp.; **John C. Leppart**, executive vice president of Mathieson, and **Raymond F. Adams**, of Adams, Forward & McLean, are new directors of Reaction Motors, Inc., Rockaway, N. J. (AVIATION WEEK Nov. 2, p. 7).

Changes

Harold J. Carrick has been appointed chief advisor of Civil Aeronautics Administration's international field office at Tokyo. **Forrest H. Morgan** is CAA's new chief advisor in Paris.

P. W. Miller, formerly with Flying Tiger Line, has become chief engineer of Thermalectric Engineering Co., San Fernando, Calif.

William R. Beattie, onetime agency-interline sales manager for Braniff Airways, has been named general sales manager for Resort Airlines.

Ray Overholt is new technical director of McMillan Laboratory's Manufacturing Division at Ipswich, Mass., taking charge of advancement of radome production techniques.

Honors and Elections

Richard Palmer, assistant to the president of Fairchild Engine & Airplane Corp., has been elected chairman for 1954 of the Washington representatives group of the National Security Industrial Assn. He also has been elected to the executive committee of NSIA.

Frank W. Fink, chief engineer of Convair's San Diego Division, has been elected national vice president for aircraft activity of the Society of Automotive Engineers.

David W. McLenegan, manager of technical personnel and education for General Electric's Nucleonics Division, is a new fellow of the American Institute of Electrical Engineers.

George F. Chapline, vice president of Fairchild Engine & Airplane Corp., and **Roger W. Kahn**, service manager and test pilot for Grumman Aircraft Engineering Corp., have been appointed to the board of trustees of Adelphi College, Garden City, N. Y.

INDUSTRY OBSERVER

► Substantial number of RB-36D reconnaissance bombers will be modified by Convair's Ft. Worth Division for use as flying aircraft carriers in USAF's FICON system (AVIATION WEEK Aug. 31, 1953, p. 12). Planes will carry a Republic F-84F in the bomb-bay for delivery of nuclear weapons by sonic-speed fighters over ranges up to 5,000 mi.

► **One limitation of passive missile homing systems, such as that in Nike (Aviation Week Dec. 28, p. 13), is that tracking radar must follow each missile from launch to impact. This limits number of targets tracked at one time to the number of radars available in the battery area. Active homing with tracking systems in each missile permits multiple or successive launches, limited only by battery logistics.**

► USAF Directorate of Flight Safety Research attributes several recent jet accidents to miscalculations of density altitude for takeoff; ambient temperatures instead of runway temperatures were used for computing takeoff distance. Importance: Jet bomber takeoff at 5,000-ft. altitude is 11,000 ft. at 59 F conditions but increases to 15,150 ft. if temperature is near 100 F. Takeoff distance emphasizes importance of Rato to USAF jet bomber operations.

► **Watch for first airline use of transistors in new magnetic microphone developed by Remler Co., Ltd., San Francisco. Microphone features built-in transistor pre-amplifier—reported to improve intelligibility and reduce noise, compared with current carbon mikes. More than 1,000 hr. of airline testing has been completed, and one major carrier is reported ready to place a fleetwide order.**

► Helicopter normal power loadings could be reduced as much as 25% by the use of gas turbines in short-haul designs, says E. F. Katzenberger of Sikorsky Aircraft. Although the gas turbine offers the ultimate solution, he predicts that five to 10 years of profitable service in copters will be accumulated by reciprocating engines before they are made obsolete by the gas turbine.

► **Total of USAF jet flight hours is now nearing the 5-million mark. In 1949, only 500,000 hr. had been racked up by the Air Force. Only one-fourth of current USAF flying time is in jets.**

► Wreckage of crashed Texas A&M AG-1 agricultural monoplane designed by Fred Weick has been taken over by Transland Co., El Segundo, Calif., for rebuilding, possibly with a more powerful engine. AG-1 crashed near Lubbock, Tex., June 26, but the pilot walked away unhurt (AVIATION WEEK Aug. 24, 1953, p. 15).

► **Convertiplanes with vertical-lift capacity of the helicopter and capable of high supersonic speeds will be developed within the next 20 years, predicts Frank N. Piasecki, board chairman of Piasecki Helicopter Corp.**

► North American Aviation is designing a $4-million windtunnel for subsonic, transonic and supersonic work to be built adjacent to its Los Angeles plant.

► **Aeronautical Radio is making another try to get FCC approval for a nationwide network of airline VHF stations to be owned and maintained by American Telephone & Telegraph Co. AT&T has worked out new plan that would give Arinc personnel access to VHF equipment on AT&T property, hoping to counter one basic objection that FCC raised to original plan (Aviation Week Oct. 19, 1953, p. 100).**

► Buffalo Division of Twin Coach Co. is tooling for production of center panels and wings for the Navy Grumman S2F sub-killer and parts for the USAF Boeing B-52.

► **Douglas Aircraft Co. has delayed altitude record attempts by its XF4D-1 Skyray pending work on the Navy fighter's Westinghouse J40 turbojet, which has been returned to the engine producer.**

Washington Roundup

ACC Production Policy Review

The President's air policy study by Air Coordinating Committee (AVIATION WEEK Nov. 16, p. 13) will include a "review of policies affecting the aircraft manufacturing industry." ACC, under chairmanship of Commerce Undersecretary Robert Murray, added this item to the Presidential policy review agenda at its most recent meeting in response to heavy pressure from members of Aircraft Industries Assn.

Membership of the new ACC subcommittee for this manufacturer policy review had not been named last week. It will include military and civil representatives, who will submit recommendations to the President on:

- **Constant production volume** vs. previous peak and valley trend.
- **Profit margins,** generally near 2½%, vs. prevailing U. S. manufacturing levels above 5%.
- **Accelerated tax amortization** and other promotional devices.

Deadline for the body of the ACC report to the President is Apr. 1.

New Session: Wait and See

The new session of Congress probably will take a few weeks before tackling aviation issues, awaiting the President's program.

- **State of the Union message** by the President Jan. 7, giving highlights of the Administration's program in generalities, is not expected to say anything new on defense.
- **The President's economic message,** due the following week, is expected to spell out the Administration's plans to meet a recession with spurs to business activity and public works, such as airport development. Commerce Department's Business and Defense Services Administration, which has industry divisions on aircraft and electronics, has been working several months on ways to assure sound economic growth.
- **The President's budget message,** not likely to go to Congress much before the Jan. 21 deadline, probably will be the first disclosure of details on the Administration's specific civil and defense aviation programs. After that, congressmen will be ready to go into action.

Security on Speed

USAF has clamped a security restriction on the release of information on any future speed record attempts or speeds attained by new aircraft.

The order by Air Force Secretary Harold Talbott follows the suggestion of Trevor Gardner, special assistant for research and development, to ban such information from the public on the grounds it endangers the national defense.

Talbott's order will not affect a transcontinental speed run scheduled soon by Col. Willard W. Millikan in an F-86. Skeptics say the ban will hold up until the Navy comes up with another record and announces the results.

Aeronautics Act Rewrite?

Whether Sen. Pat McCarran's new demand for a rewrite of the 1938 Civil Aeronautics Act will revive the Cooper subcommittee, set up to do the job, is questionable. The subcommittee has shown no sign of action since the death of Sen. Charles Tobey, former chairman of Senate's Commerce Committee.

The outcome depends on talks between Sen. John Bricker, new full committee chairman, and Sen. John Sherman Cooper, chairman of the subcommittee. Sen. Edwin Johnson, a member of the subcommittee, is skeptical that it may be used as a sounding board for nonscheduled airlines.

Each year for the past several years, McCarran has proposed rewriting the act to regulate nonskeds, create an independent safety board and consolidate all international carriers.

Civil Air Problems

Among civil aviation government and industry problems facing the President in 1954 are:

- Post Office Department pressure to cut more airline mail rates set by Civil Aeronautics Board. High-rate domestic trunklines last week were forced by P.O. to meet competition (see p. 67).
- Civil Aeronautics Board tendency to preserve its previously established airline route patterns vs. Administration pressure to reduce subsidies by changing some systems.
- Technical disagreements holding up civil and military agencies include which type of distance measuring equipment (navigation aid) and high-intensity approach lights (landing aid) to install in fiscal 1955.

Subsidy Justification

Local service airline supporters will add a national security interest to their 1955 subsidy justification before Congress. Previous local service subsidy budgets were justified largely upon the benefits of local convenience.

Scheduled DC-3 air service, where surface transport is much slower, can promote industry decentralization—a major requirement for increasing U. S. security.

Feeder airline subsidy is $25 million a year, as passengers pay only about half the actual cost of the service.

More Airpower

Two retired Army generals are continuing their campaign for more emphasis on airpower and less on surface forces: Lt. Gen. Albert Wedemeyer, now a director of Avco Manufacturing Corp., and Brig. Gen. Bonner Fellers. Both backed the Republican drive, led by the late Sen. Robert Taft, to cut ground forces in Europe and put the effort into airpower.

In testimony before the Senate's Strategic Metals Subcommittee, supporting Western Hemisphere self-sufficiency, Wedemeyer said: "I have never seen a statement by any military leader whose judgment I respected to the effect that we could definitely hold at this time Western Europe if war were to occur tomorrow. My principal employment of these surface forces would be to insure the effective employment of airpower."

Local Airlift Retention

Post Office Department plans to retain the right to reactivate mail airlift on local service lines in the event floods or other emergencies knock out competitive surface transport facilities.

P. O. dropped its 30-cent-a-ton-mile holiday mail airlift on Christmas Day —**Washington staff**

AVIATION WEEK VOL. 60, NO. 1
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AIA Sales Forecast for 1954: $9 Billion

- **Aircraft manufacturers will equal 1953 record, with military output remaining at 1,000 planes a month.**
- **But industry association presses program to insure sound base for expansion in case of national need.**

Aircraft sales in 1954 will approximate the $9-billion level estimated for 1953, third largest in the history of the industry.

Aircraft Industries Assn., in a year-end review and forecast, also predicts:

• **Unit production** of military aircraft will remain at the present level–about 1,000 planes a month, after which it gradually will taper off. Military aircraft output during 1953 represented 90 to 95% of the volume of work performed.

• **Present production trend** will continue in airframe weight, reaching its peak in the second quarter of 1954. A decline is expected then, although not to as marked degree as the reduction in units. Deliveries of airframe weight in 1953 were about 150 million lb.

• **Increased production** of helicopters and utility aircraft for commercial use with a further decline in transport airplane output.

• **Employment** will not exceed 775,000 and, beginning with the second quarter of the year, will drop to about 725,000 by year's end.

By December 1953, approximately 770,000 workers were engaged in aircraft production. Counting employes of subcontractors and major suppliers, the aircraft production workforce is estimated at more than 1 million.

• **Continued curtailment** of the large-scale subcontracting that marked the Korean war expansion program. Prime producers will perform more work as their production rates are reduced.

• **New jet fighter** models will reach volume production, and deliveries of jet bombers will continue their increase. First deliveries of a turboprop transport model for the military are in prospect.

• **Jet aircraft** production will increase and, by the end of 1954, may comprise 75% of the monthly military aircraft deliveries.

Last piston engine bomber probably will be delivered during 1954. Last year, for the first time, the number of jet-powered planes produced exceeded piston engine output.

► **Program Offered**–AIA called for action to insure that reductions will not dislocate effectiveness of the industry and its ability to expand rapidly in the event of a major emergency.

Points listed by AIA as necessary to such policy and programing:

• Maintenance of a strong and active program of research and development, irrespective of periodic fluctuations in the international situation. Such a program should use the full competitive values of a resourceful aircraft industry.

• Maintenance of a sufficiently broad production base within the industry to permit rapid expansion in the event of an emergency.

• Maintenance of a going rate of production sufficient to hold together an important nucleus of engineering and production teams and to provide the military services with the latest and best weapons.

• Recognition of the vital importance to national security of a healthy, stable private aircraft industry–financially strong and unhandicapped by a policy that limits its profits on sales to less than half the national industrial profit average.

► **Production Up**–Monthly sales of more than $900 million were being registered as the year ended. From an annual production rate of 3,000 aircraft in 1950, the output increased to 12,000 in 1953. During this period, the workforce climbed from 262,000 to 750,000; floor space expanded from 63.5 to 135.8 million sq. ft.

Approximately $3.5 billion was expended for new facilities, with 66% of this amount going for tools and equipment and the balance for plants and structures. A larger share of this expansion was privately financed as compared to the World War II record.

"During 1940-45, $3.8 billion was invested in facilities of which only $420 million or 10.8% was privately financed, while during the expansion resulting from the Korean mobilization, $1.2 billion or 34.1% was privately financed," AIA notes.

► **Larger Utility Planes**–Civil aircraft production during 1953 continued at substantial rate. Transport aircraft production was estimated at about 315 units, of which about 210 were twin-engine executive types and 105 were 36-passenger or larger. Unfilled transport aircraft orders exceeded 300 units as the year ended.

Production of utility aircraft increased approximately 8.5% over the 1952 output. The increase in unit production to an estimated 3,800 in 1953 from 3,509 in 1952 was marked by an even greater percentage increase in airframe weight as more and larger utility aircraft were sold for business purposes.

Helicopter production reached an all-time high and constantly increased throughout the year. For the second consecutive year, the backlog of helicopter manufacturers exceeded $500 million.

► **Missile Backlog**–Activity increased in the production of guided missiles with several new types being delivered on a production basis. Unfilled orders for missiles were well over $1 billion, although delivery rates gained monthly.

Sales volume of the 12 largest airframe companies probably will exceed $5 billion in 1953, compared with 1952 sales of $3.7 billion. This is the largest volume of sales reported by these companies since World War II.

Profits for the year are estimated at $102 million or 2.3% of profits to sales. This level of profits to sales compares to a 1952 average of 5.4% for all manufacturing industries.

In the materials field, major problem facing government and industry is the production of titanium. Industry experts estimated a requirement of 250,000 tons by 1960. The Defense Mobilization Board is seeking to produce an additional 20,000 tons of sponge annually within the next three months (see p. 15).

► **Significant Changes**–AIA lists the fol-

Aircraft Harvest

Military aircraft produced since the start of Korean hostilities (June 1950) has reached more than 27,500. The breakdown:

Year	Production
1950	3,000*
1951	5,000
1952	9,000
1953	12,000

*Approximately 1,500 built after June 1950.

lowing as significant changes taking place during 1953:

• **Substantial reduction** in the 1954 national defense budget—especially in appropriations for procurement of aircraft, which amounted to approximately $4 billion.

• **Broad reorganization** of governmental mobilization responsibilities.

• **Reprograming** of aircraft procurement, which eliminated from future production schedules certain older aircraft types to provide added funds to increase orders for newer models.

• **New Administration** policy to narrow and deepen the production base that resulted in phasing out many of the major subcontractors and licensees who had been brought into aircraft manufacture during the post-Korean expansion.

Copter Operations Increase in Alaska

Contract copter operations are making steady increases in Alaska, reports Rick Helicopters of Los Angeles.

The company cites its own 1953 operations, flying 13 copters for a total of 6,200 hr. on work for the Army Map Service, U.S. Coast & Geodetic Survey and U.S. Geological Survey.

In comparison, Rick operated two helicopters under contract in Alaska, for a total of some 560 flight hours during 1950; four copters for nearly 2,000 hours in 1951; 10 in 1952 for just a few hours less than 5,000.

AF Settles on $13-Billion Budget

New fiscal program is geared to buildup of 137 wings, probably will face some opposition in Congress.

Big slice of the $32-billion-plus military budget for fiscal 1955—about 40% or $13 billion—will go to the Air Force in line with the Administration's decision to concentrate on airpower in the nation's defense program.

It will top USAF's current fiscal 1954 budget of $11 billion by approximately $2 billion and is geared to achievement of a 137-wing force by 1957. It would increase to $85 billion the total appropriations to USAF in the three and a half years since the Korean outbreak.

Air Force generally seems content with the final outcome of the Joint Chiefs of Staff's review of the military program and the fiscal 1955 budget. It appears doubtful USAF will give even tacit support to any move on Capitol Hill for a bigger boost in airpower funds.

► **Diminishing Antagonism**—USAF's Assistant Secretary in charge of the budget, H. Lee White, works well with both the USAF military and Defense Department's comptroller, Wilfred McNeil.

Air Force antagonism to McNeil, whose reserve admiral status aroused USAF suspicions of prejudice, seems to have diminished. Capitol Hill attacks last year on the Administration's $5-billion slash in the AF budget were directed primarily at McNeil and secondly at Defense Secretary Charles Wilson.

But contention in Congress, nevertheless, is likely:

• **Some airpower advocates** do not like the cutback from AF's 143-wing goal and do not think JCS has gone far enough in emphasizing air in the new program.

• **Wilson's cancelation** of 748 planes from the USAF program will be challenged. The Administration will stand pat on its argument that no combat planes have been eliminated in the process.

Through reduction in lead time and manufacturers' backlogs of orders, planes have been taken out of the program to be put back at a later date, they claim.

► **Budget Outlook**—Appropriation requests will not be released until the President submits the budget to Congress, probably the third week of January. But this is the outlook:

• Aircraft and related procurement request will approximate this year's $3.5 billion. This overall category includes aircraft, initial spares and parts, guided missiles and other equipment. Money appropriated since the mid-1950 Korean outbreak totals $33.5 billion.

The $3.5 billion is considered a level-off rate that will be sustained. The $30 billion appropriated in fiscal 1951, 1952 and 1953 provided for the buildup. A $6-billion-a-year expenditure rate, however, probably will be sustained until USAF's unexpended balance for procurement, now $20 billion, is reduced.

• The trend will be toward less emphasis on spares and parts and engines, leaving a greater portion of purchasing funds for airframes. This is due to new ground rules, already set for spares and parts purchasing and now in prospect for engines.

USAF earmarks only 28 to 30% of total plane cost for spares and parts, compared with 64% a year ago. Life expectancy of the J47 engine has been increased from 150 to 300 hr., halving the procurement requirement. Test runs are being made on other engines, with plans for extending their life expectancy.

• There will be no sharp increase in the request for new guided missile money to indicate a marked switch from piloted planes in USAF composition. This item is expected to approximate $500 million.

• Research and development request

FSF Presents Air Safety Awards

Winners of the 1953 awards for "achievements in safer utilization of aircraft," presented annually by Flight Safety Foundation on behalf of Aviation Week, are seen with FSF managing director Jerome Lederer (center) following formal announcement at the organization's annual award dinner, at San Bernardino, Calif. The dinner was held in conjunction with FSF's annual air safety seminar (Aviation Week Dec. 21, p. 17). In photo above (left to right): Dr. Ross A. McFarland, associate professor of industrial hygiene at Harvard School of Public Health, who was honored for his book, "Human Factors in Air Transportation"; M. G. Beard, chief engineer for American Airlines, who was recognized with committee S-7 of the Society of Automotive Engineers for setting standards for cockpit layout, location and actuation of controls, cockpit visibility and lighting; Lederer; and Irving Pinkel, who received an award with associates at National Advisory Committee for Aeronautics Lewis Flight Propulsion Laboratory for study of origin of fires and development of means of reducing their probability. At right is one of the military speakers at the FSF seminar, Brig. Gen. Richard J. O'Keefe, USAF, Directorate of Flight Safety Research, Norton Air Force Base, San Bernardino.

will keep the program, which has steadily expanded since the Korean outbreak, at its current level that involves $450 to $500 million a year in obligations. More emphasis will be put on air defense weapons in the program.

• A major expansion in USAF research and development facilities, probably more than $100 million, will be proposed.

• Personnel funds will provide for only a maintenance of USAF's current strength of 960,000, despite an increase in the number of wings. Air Force is counting on better utilization to accomplish this.

Under Project Native Son, overseas military personnel leaving the service through normal attrition are being replaced with foreign nationals. In addition to releasing military personnel for other duties, this project has saved an estimated $100 million so far by cutting out dependent costs, overseas transportation, replacement training, and taking advantage of lower foreign wage scales.

USAF also is taking steps to eliminate the 70,000 who were in surplus skills this spring, encouraging them to leave the service or transfer to shortage skills.

Piasecki Starts Study Of H-21C Breakup

Detailed investigation is underway to determine why a new Piasecki H-21C Work Horse broke in two while undergoing dive and pullout tests on Dec. 23, a company spokesman reports. The tandem-rotor copter came apart just ahead of the engine section, but the pilot parachuted safely.

Early studies indicate the failure was progressive, because parts have been found scattered over a considerable area. There has been no action to ground the H-21-type copter as a result of the accident AVIATION WEEK is told.

The H-21C is the latest production model in the Work Horse series—powered by a 1,425-hp. Wright R1820 engine, compared with 1,150 for previous types.

Short to Help Build New Bristol Britannia

(McGraw-Hill World News)

London—Bristol Aeroplane Co. has licensed Short Bros. & Harland to build Britannia airliners and expects this second assembly line eventually will increase production of the turboprop transport to 50 a year.

The contract indicates Bristol has bullish sales hopes for its four-turbine liner. So far, only British Overseas Airways Corp. has placed firm orders—for 33 Britannias. But Qantas Empire Airways has tendered a letter of intent for six, and seven other carriers are talking about buying a total of 51.

These are in addition to an estimated 50 maritime reconnaissance versions of the Britannia that will be produced by Canadair for the Royal Canadian Air Force.

► **Largest Floor Space**—Short's plant at Belfast, Northern Ireland, has the largest production floor space in the U. K.

Scheduled to be built there under Bristol's subcontract are Britannia Mk. 300s and the planned Mk. 250. Fuselage of the Mk. 300 measures 124 ft. 3 in., longer by 10 ft. 3 in. than the earlier Mk. 100, and is powered by four Proteus 750 turboprops of 4,150 eshp. each.

The Mk. 250 dimensionally will be the same as the Mk. 300, but its design will enable it to carry passengers and freight.

The subcontractor will build half of the transport, importing the remaining parts from Bristol.

Short Bros.—owned 80% by the British government and 20% by private interests—also has a subcontract to build 15 de Havilland Comet 2 jet transports, is producing its own S.B. 6 Sea Mew for the Royal Navy (AVIATION WEEK Dec. 21, p. 41), and is manufacturing parts for the Supermarine Swift fighter.

► **Superseded Mk. 100**—Of BOAC's orders for the Britannia, 15 are for the Mk. 100—already virtually superseded by the higher-powered, longer 300s. The carrier also has ordered 13 Mk. 300s, including three long-range versions with options for two more, and plans to purchase five Mk. 250s.

Qantas intends to buy six passenger-freighter versions.

First deliveries of production Mk. 100s, powered by Proteus 705 engines of 3,780 eshp. are scheduled for delivery to BOAC late this year.

The carrier probably will have the 70-ton transport in service on North Atlantic routes by late spring or early summer of 1955—about three years after the prototype's first flight.

New Grumman Sub-Killer Catapults From Baby Flattop

New twin-engine Grumman S2F-1 anti-submarine plane is catapulted from the deck of escort-class carrier USS Mindoro during qualification trials. S2F is the first multi-engine plane of standard configuration to be launched and retrieved aboard a CVE-type carrier. In 1946, a Ryan Fireball fighter, powered by a piston engine in the nose and a jet in the tail, also operated from a small aircraft carrier. The S2F combines the hunter and killer functions of anti-submarine aircraft now handled by two separate planes working as a team, one carrying detection gear and the other with offensive weapons. S2F has long-span flaps, partially depressed during takeoff, short ailerons and multi-section lateral control devices in the upper portion of the wing just ahead of the flaps. Powerplants are two 1,425-hp. Wright R1820s. Plane has tricycle landing gear with nose wheel in addition to tailwheel.

DMB Plans Titanium Production Buildup

The Defense Mobilization Board has approved expansion of the titanium program and the plan is to contract for $75 million in plants and equipment to increase production by 20,000 tons of sponge annually within three months.

The action follows testimony by the Air Force and aircraft manufacturers before the Senate's Strategic Metals Subcommittee that production of the metal is drastically short of requirements (AVIATION WEEK Oct. 26, p. 14; Nov. 23, p. 22; Dec. 7, p. 14).

Before the subcommittee, headed by Sen. George Malone, focused on the critical bottleneck in the airpower program, Office of Defense Mobilization and General Services Administration lagged on expanding titanium output.

ODM cut Defense Department's recommendation of a goal of 35,000 tons annually by 1956 to 25,000 tons. GSA has contracted for 13,000 tons of this expansion so far. Production for 1953 was only 2,400 tons.

The board, composed of Cabinet officers, recommended:

• **ODM establish** a titanium committee "of top-level experts under the chairmanship of a person commanding public respect and confidence and well qualified to assume such an assignment." The committee would "immediately develop" a titanium expansion program, working in cooperation with Air Force and other interested agencies.

• **GSA** move forward in negotiating contracts up to the present 25,000-ton goal and go beyond this if possible.

Leading candidates for contracts for additional titanium expansion: Titanium Metals Corp; du Pont de Nemours Co.; and Monsanto Chemical Co.

Titanium Metals and du Pont each hold a contract to produce 3,600 tons a year. The only other company in the sponge production program, Crane Co., has a contract for 6,000 tons a year but will not get into production until 1955.

Incentives will be offered—cash advances against future production, fast tax writeoffs on new plants and market guarantee arrangements.

New Airline Begins West Coast Operation

A new scheduled airline plans to start operations this month, serving Spokane, Pasco and Seattle. The line is owned by the Johnson Air Service of Missoula, Mont., which for years has supplied pilots and planes to the U. S. Forest Service in Pacific Northwest states.

William Lockwood, operations manager and chief pilot for the line, says Civil Aeronautics Administration has granted an intra-state certificate for four roundtrips daily between Spokane and Seattle with an intermediate stop at Pasco.

Johnson plans to operate DC-3 coaches for passenger and freight service and will add a C-46 if freight warrants. Passenger rates: $10.95 plus tax between Spokane and Seattle, $5.95 between Spokane and Pasco.

Industry's Major Task Is Air Buildup: Peale

Two major objectives the aircraft industry must concentrate on during 1954 and 1955, says Mundy I. Peale, Republic Aviation Corp. president, are:

• **Reach and hold** to production schedules established for new planes by the armed forces in the buildup of national air strength.

• **Prepare** for volume production of still newer jets that will be needed in the 1956-59 period.

Peale predicts in a year-end forecast that production will remain relatively steady during the next 12 months. In 1953, the industry delivered to the armed forces approximately 12,000 new planes, he estimates. He says this production rate of about 1,000 military planes per month will continue with slight variations well into 1954.

"The fact that a young industry (aviation) that has had a helter-skelter history can now assume such stature in the overall economy," he says, "emphasizes the rapid strides being made in aviation, as well as the need for careful study of all problems relating to the national airpower policy.

"The continued prosperity of the country, quite apart from its military safety, is very significantly bound up with the preservation of a stable and solid aviation industry."

Peale reports the once formidable problems of transonic and supersonic flight are being solved and "we know now that there is theoretically no barrier to speeds up to that of light itself—if that is what we need."

Jet Liners Will Be Easy to Fly, Pilot Says

Pilots of future jet transports will not need to be "supermen" nor will they find transition from conventional four-engine airliners difficult, Edwin Bracher, Boeing Airplane Co. test pilot, believes.

He says the transition "will be simpler than switching from two- to four-engine airplanes" and claims age will be but a minor factor in choosing transport pilots of tomorrow.

▶ **Unmatched Experience**—Boeing is building a prototype jet transport that is scheduled to fly late this year (AVIATION WEEK June 29, p. 12).

Bracher says the company has gained a background of experience with large, multi-engine aircraft unmatched anywhere in the world through production of B-47s and B-52s.

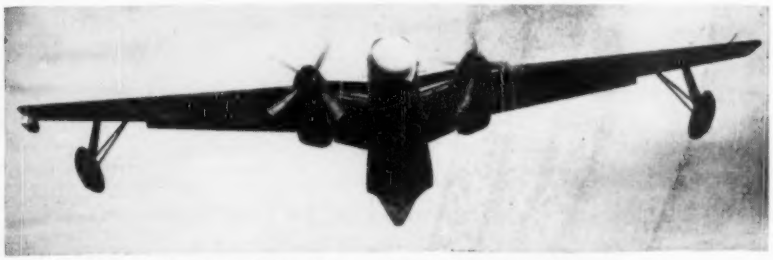
"We at Boeing like to consider ourselves as thinking today of tomorrow's airplanes while profiting by the experience of yesterday," Bracher told a joint meeting of the Institute of the Aeronautical Sciences and Air Line Pilots Assn.

"I mention this to dispel the misconceptions that many of our airline pilots today have toward flying multi-engine jets. . . .

"Many people are of the opinion that because jets have greatly increased speeds and operate at higher altitudes than present day airplanes, pilots will necessarily need to be of the superman type. But these factors are offset by the simplicity of jet engines, improvements in pressurization, new safety features and simplified cockpit instrumentation, to mention only a few."

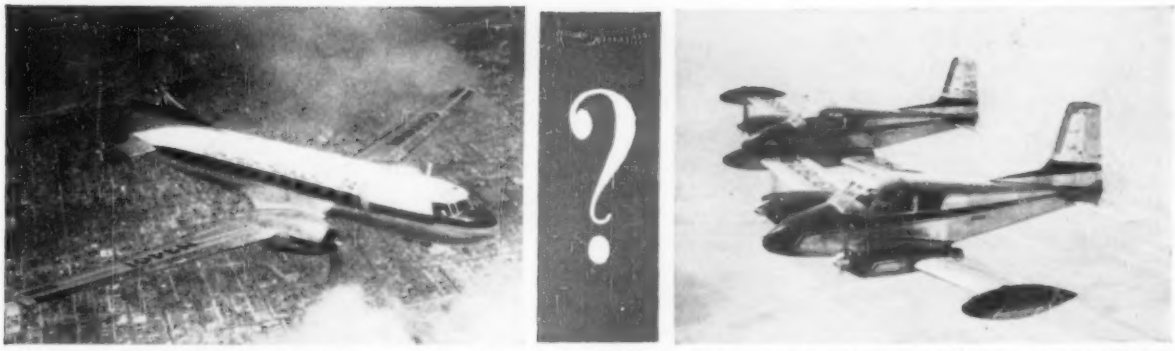
▶ **Limited Access**—Bracher admits that current ideas concerning jet flying are understandable because America has been devoting its turbine airplane production to the military for defense.

"Because of this," he says, "the general public has had but very limited access to information on the subject."



Marlin Displays Its Narrow Beam

Streamlined high length-beam ratio hull of new Martin P5M-1 Marlin Navy patrol bomber flying boat is shown to advantage in this head-on view of the plant in flight. Flaps are lowered slightly. This Marlin is carrying four rockets externally beneath each wing just outboard of the engine nacelles. High-power searchlight is fitted to right wingtip.



ADVANCED BUSINESS plane design lies somewhere between characteristics of Convair 340 and Cessna 310 types, suggests Hewitt.

Business Flying

Market Research a Key to Business Plane

By Frank Shea, Jr.

The job of determining a twin-engine business plane design that will meet requirements of the major portion of the business flying market rests squarely with the manufacturers, according to a specialist who recently completed an exhaustive survey in that field.

Need for such a design is acute, says Robert Hewitt, president of the business flying consulting firm of Robert Hewitt Associates.

► **Old Designs**—He points out that over 85% of the twin-engine business planes currently in operation are based on designs of 1935-1939 vintage, while the remaining 15% were built to lure single-engine owners into a low-priced twin class.

"What is needed is a 1954 design which will reflect the significant technological advances made in aviation over the past 20 years, says Hewitt. This aircraft should be based on practical user requirements, dictated by strong economic factors as well as pilot-passenger considerations. It must be equipped for day, night and instrument conditions.

"But," he continues, "before such an aircraft can be designed, developed, produced and sold, manufacturers must give more consideration to the relationship of the product to the specific market."

► **Ideal Design**—It would appear, Hewitt notes, that the "ideal" business aircraft design lies somewhere between the performance characteristics of the Convair 340 and the Cessna 310. He adds that the 340 extreme could be extended to include a jet type in the foreseeable future.

But for the present, he estimates that a 340 type might satisfy about 10-20% of the current owners, while types in the performance range of the 310 and higher should satisfy a larger portion.

"Specifications for the plane that will appeal to the mass market should be found within the range of the performance characteristics of these two aircraft," Hewitt observes. "But how do we arrive at these specifications?

"The problem is one of marketing and sales, not the ability of the aircraft industry to aerodynamically design, produce and financially support development of the right business aircraft," he contends. "This ability is a proven fact as represented by the types of aircraft, volume of business and net worth of the manufacturers who supply the military market."

► **Answers Needed**—A marketing research and sales program, he says, will determine the answers to the questions:

- **What to build?**
- **Who will buy?**
- **How to sell?**

As contrasted with the market research trend in general business today, Hewitt notes that complete business aircraft marketing research is almost nonexistent, primarily because the industry has been under constant pressure filling military requirements and the business aircraft market has only recently attained a status of major importance.

"For the most part," he says, "sales to date have originated with the prospect approaching the salesman, rather than as the result of a sales program which follows the selling steps—prospect analysis, approach, establish the need, present the solution, demonstrate the product and close the sale."

► **1,000 Twins**—In spite of the limited marketing and sales effort since 1946, he adds, twin-engine business aircraft ownership has increased from fewer than 50 airplanes to approximately 1,000 today, with approximately 50% converted from military and airline equipment.

Voicing his ideas on a program which might be followed in business aircraft development, Hewitt says: "Much credit must be given to the present aircraft owners for their pioneering in this new mode of transportation, as well as to a few manufacturers, converters and fixed-base operators.

"But continued business aircraft ownership, operation and development depends largely upon the industry's approach to the market; first in satisfying the prospect's transportation requirements at a fair price which will be mutually profitable to all interested parties and; secondly, to their ability to secure the cooperation of the business aircraft owner in obtaining data necessary to the development of new products and services."

► **His Plan**—Hewitt's approach to the development of business aircraft, allied products and services is broken down

What Are Your Views?

An article in the Oct. 5 AVIATION WEEK, which announced that a new information service for the business flying field has been made available by the firm of Robert Hewitt Associates, aroused such widespread interest that the editors have again interviewed Mr. Hewitt, requesting his views on the possibility of arriving at a new business plane design.

AVIATION WEEK plans to continue this series of articles on business flying, and invites comments, views and opinions from those actively engaged or interested in this relatively new but vitally important segment of aviation.

Airline Hostesses: 32 Too Old?

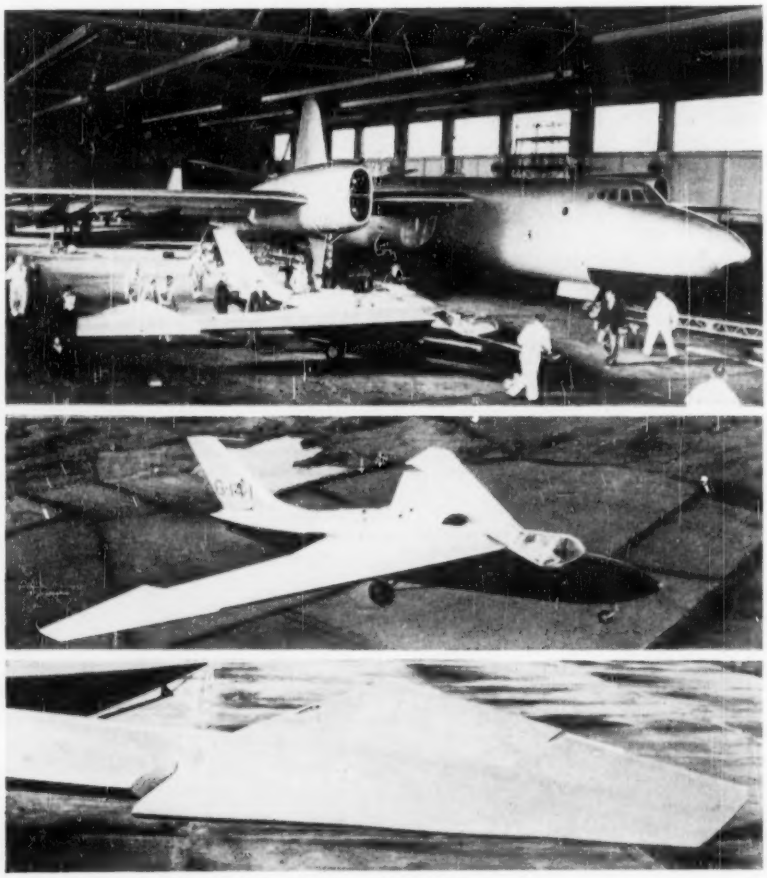
Problem of the age is facing U. S. airlines: When does a stewardess lose her appeal and ability?

American Airlines says age 32, and has asked 75 of its 1,100 stewardesses who are that age and over to resign. Other airlines have considered similar moves. The Air Line Stewards and Stewardesses Assn. promptly stepped in, prevailed upon AA to delay setting a date pending further study.

"It is the policy of American Airlines," a company bulletin states, "that all stewardesses shall be less than 32 years of age. . . . It is based on the established qualifications of stewardesses, which are: an attractive appearance, pleasant disposition, even temperament, neatness, unmarried status and ability and desire to meet and serve passengers. Basic among these qualifications is an attractive appearance. Such an appearance ordinarily is found to a higher degree in young women."

AA's plan is to give each "overage" stewardess one week's termination pay for each full year of employment up to eight years maximum. Women's groups are entering the argument, protesting the move is a slight against American womanhood.

The union is banking on such protests to squelch the whole affair.



Close Look at Short Sherpa

Short Sherpa experimental jet research plane, which will test characteristics of aero-isoclinic wing configuration, is detailed in these views of the plane being flown in Northern Ireland. Top photo shows Sherpa being maneuvered out of its hangar, nearby personnel providing some idea of plane's size. Short S.A.4 four-jet bomber, being used for high-altitude research, is in background. Center picture, Sherpa flying, shows up lack of horizontal tail. Movable wingtips (closeup at bottom) act as combination ailerons and elevators. Powerplants are two small Turbomeca jets in fuselage.

into three separate stages, namely: conception stage; planning stage; execution stage.

Explaining the program, Hewitt says, "The conception stage covers a survey or study of the market to determine its potential and to establish the Who and What of the market: Who will buy?—What will they buy?

"Completion of these phases will bring out certain requirements which should be incorporated into the tentative product designs. Next step is to paper-test the tentative products. This would be a choice-test to determine which of a selected number of designs would best meet the prospect's requirements."

▶ **Stage Two**—At this point, he recommends that a report on the program should be prepared from which management can make the decision—to continue or not to continue through stage two, the planning stage.

"The planning stage," he continues, "involves first the building of the prototype or prototypes. The next steps would be carried on simultaneously. The physical market-test of the prototype would be through demonstrations to a pre-determined cross-section of the market, concurrently developing the marketing or sales plan and incorporating the proven sales features determined from the demonstration phase. Production plan is developed at same time as marketing plan."

▶ **Stage Three**—At this point, he says, the necessary facts and figures should be available for the management decision.

"Final stage, the execution stage, covers management's coordination of the plans developed," Hewitt points out. He explains that breaking points between each stage are designed in order that management's test and evaluation may be made at completion of a complete unit in the program, each unit being a definite break in the program investment factor.

These stages could be subject to overlap, he notes, brought about by conditions existent at the time the program is put into operation.

Although Hewitt's outline is applied to an aircraft, he emphasizes that the same factors and program could be applied to allied equipment or services with minor changes in procedure and subject data.

In conclusion, he says an aircraft manufacturer adopting such a program should be guaranteed a lucrative market among U. S. firms hungry for an aircraft designed specifically for their business flying requirements. He adds, "Until an active, organized program for collection and evaluation of information is put into effect, the 'ideal' business aircraft will never fly off the drawing boards."

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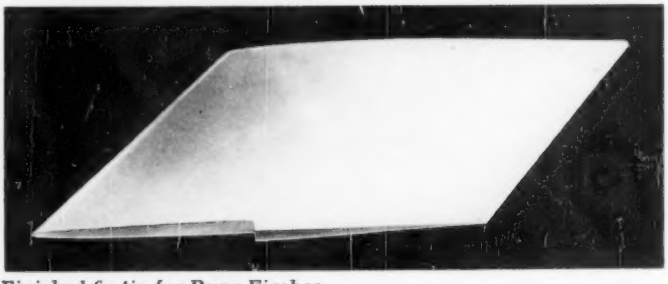
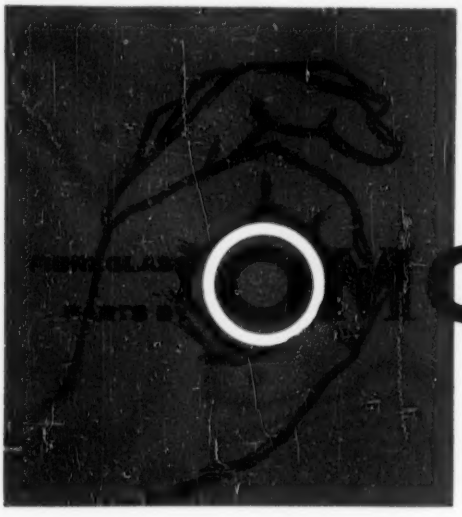


Finished fin tip for Ryan Firebee



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NEWS SIDELIGHTS

Announcement of an order for DC-7s by Pan American World Airways has answered questions of those who wondered what PAA was going to do to compete with United's DC-7s on the lush Honolulu routes.

Ryan Aeronautical Co. believes the report in another aviation publication that Navy had decided against its side-by-side trainer in the competition at Pensacola may have prejudiced its case. The report, later labeled false by Navy, appeared while the competition in Florida still was under way.

Early company investigation indicates that crashes of two Northrop F-89Cs during simulated combat maneuvers in Wisconsin may have been due to careless handling during supersonic dives.

Estate of Kim Sigler, former Michigan governor and aviation leader who was killed Nov. 30 when his plane struck a television tower guy wire (AVIATION WEEK Dec. 7, p. 7), is facing a damage claim as a result of the crash. Tower was destroyed and owners of the new television station say start of their broadcasting operations has been delayed a year.

Present five-year plan for a new Japanese air force calls for an increase of 100 to 150 lightplanes during 1954 over present strength of 30-40. Eventual plans are based on a strength of 700-800 jet fighters. Observers expect an independent air force, separate from the army, when the time comes. At present, there is no separate Japanese air force, merely an air arm of the so-called National Safety Force.

It hasn't been revealed, but USAF, in an effort to boost F-86 performance in Korea to meet the altitude and rate-of-climb advantages of the MiG-15, equipped some Sabres with Rato units. Although the combat tests were unsuccessful, the idea of some such boost to give U.S. fighters super-performance when needed has not been dropped.

When adding up uses for guided missiles, don't overlook the possibility of a bi-medium missile capable of travel through either water or air. A submarine could fire such a missile without necessity of surfacing.

DEER FRIENDS: High ranking hunting party pictured recently at ranch near Lupton, Mich., shows varied taste in costumes. Left to right (seated): Television star Arthur Godfrey, Defense Secretary Charles E. Wilson, Fairchild Aircraft President Richard S. Boutelle and General Motors executive Harley J. Earl. Standing, left to right: USAF Gen. Curtis LeMay, GM executive J. R. Salzman and hunting host Harold R. (Bill) Boyer, GM executive and former head of Aircraft Production Board.

have you heard this one about TURBINE WHEEL BROACHING ?

Here's an instance where **LAPOINTE** engineering resulted in the saving of time and money, tools and machines, because of an *interchangeable fixture.*

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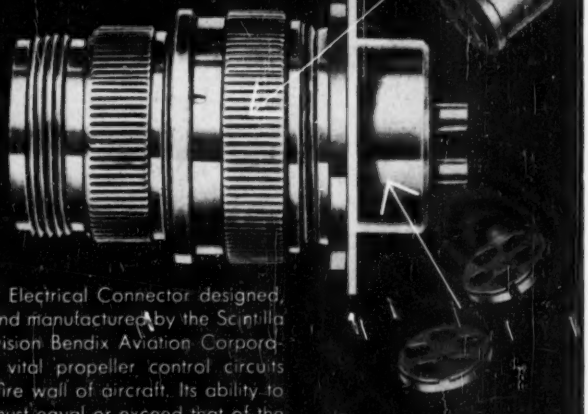

This fire wall Electrical Connector designed, developed and manufactured by the Scintilla Magneto Division Bendix Aviation Corporation, carries vital propeller control circuits through the fire wall of aircraft. Its ability to resist flame must equal or exceed that of the fire wall itself. Tests prove that this connector which uses MYCALEX 410 and MYCALEX 410X glass-bonded mica inserts is the best solution for this application. MYCALEX insert connectors provide a full 20 minute flame barrier under direct exposure to a 2000° F flame . . . *20 minutes that could spell the difference between total loss and safe landing.* For complete information on product improvement with MYCALEX, phone or write J. H. Du Bois, Vice President-Engineering, at address below.

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Convair, IAM Reach Wage Agreement

San Diego, Calif.—Settlement of the last of the major West Coast aircraft labor contracts still under negotiation has been announced here. Convair and the International Association of Machinists (AFL) reached agreement on a contract calling for a blanket wage increase of five cents hourly, plus a one-cent cost-of-living allowance.

The agreement, covering 18,000 employes at Convair, followed the industry pattern set after failure of United Auto Workers (CIO) to impose higher wages in a seven-week strike at North American Aviation.

▶ **Retroactive**—Group insurance benefits were increased and leadman bonuses were increased from 15 to 20 cents an hour. The contract, retroactive to Dec. 14, is for one year.

Convair estimates the increase will cost the firm $3.5-million.

A similar contract between Solar Aircraft Co. and the IAM also has been ratified. The Solar agreement calls for a three-cent cost of living allowance plus a five-cent general wage increase.

Meanwhile, NAA reported it again is nearing full production and deliveries will be back to normal by February. The company said F-100 production would be on schedule despite the strike.

Although announcement of a one-dollar dividend by NAA the day after the strike ended aroused some comment, the company explained it was a scheduled dividend, that financial effects of the strike would be felt later.

Swiss Plan Domestic Helicopter Service

Switzerland's domestic air routes probably will be flown by helicopters exclusively when re-established, the director-designate of the Federal Air Office has predicted.

Dr. Markus Burkhard points out that the "schism of Europe into two parts of a stage divided by an Iron Curtain is a boon to the Swiss because many foreign carriers would otherwise not be forced to utilize Switzerland's three international airports." These are at Basel, Geneva and Zurich.

Italy Builds Small, Inexpensive Copter

(McGraw-Hill World News)

Rome—A small helicopter, weighing approximately 680 lb. and designed to cost $11,200 when produced in quantity, will be tested soon at Campoformido Airport, the semi-official Italian

moment in history

You are looking at 1/1000 of a second in the history of aviation. It occurred at a fraction past 4:31 p.m. on January 20, 1949.

This was the Zero moment which marked the official launching of the first successful pilotless bomber to be approved by the U.S. Air Force—the Martin B-61 Matador.

The picture is historic for a very significant reason: it records the tradition-shattering payoff of an entirely new development in the aircraft industry, known as Martin Systems Engineering. This is a science and a method of developing spaceborne systems as total solutions of Operations problems.

The Martin Matador is far more than the thing you glimpse here. Behind it is an integrated network of facilities designed to give this important new weapon simplicity of operation and extreme mobility. These components add up to the total solution of one of the most formidable security problems of our time.

They also add up to one of today's most important developments: the full story of Martin Systems Engineering.

You will hear more about Martin!

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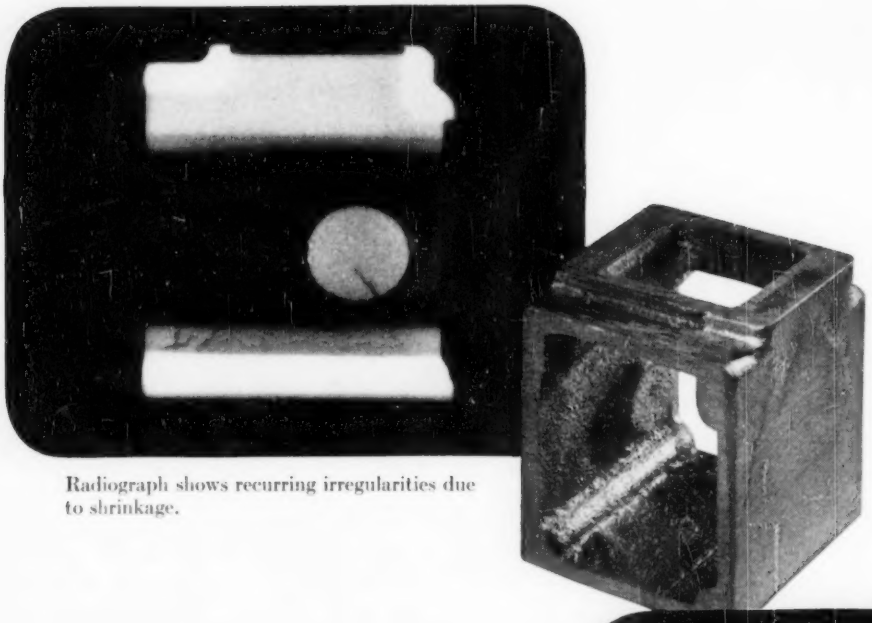
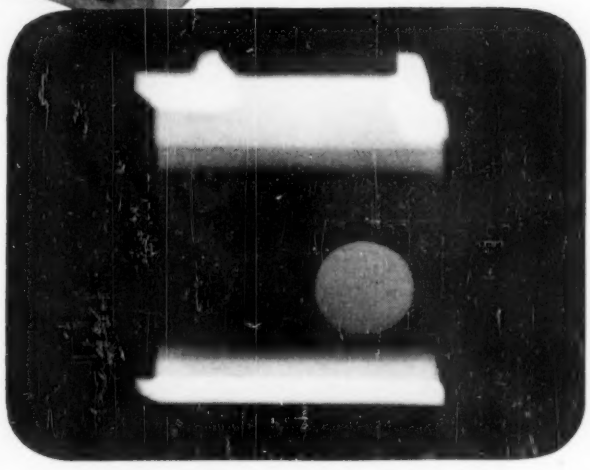


Radiograph shows recurring irregularities due to shrinkage.

RADIOGRAPHY

puts the finger on a profit thief



A change in gating produced sound castings.

Shrink was a problem in casting this instrument housing of 355 aluminum. It looked like the yield would run low.

But radiographs of pilot runs put the finger on the cause—revealed a pattern of recurring irregularities. This suggested a change in gating which, when adopted, quickly corrected the difficulty.

Cases like this show why more and more foundries make radiography a routine practice. It proves their work sound—helps build a reputation for consistently good castings.

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newspaper Il Messaggero reports.

The copter has been built by the Lualdi Works near Udine. Designers are Carlo Lualdi and Sergio Tassotti.

The craft is powered by an 85-hp. Continental engine and is designed to cruise at approximately 75 mph, according to reports. Range is given as 2¼ hr. Main rotor diameter is said to be about 24 ft. and diameter of the tail rotor is 4.4 ft. Fuselage is approximately 20 ft. long.

Asks Bay Stop

Ransa, Venezuelan airline, has applied to the Jamaica civil air authorities for permission to land at Montego Bay on its Miami-Caracas route now that the Jamaican airport has received more adequate lighting facilities. Avianca, the Colombian airline, is rerouting its weekly Constellation flight El Colombiano operating between Bogota and New York via Miami through Montego Bay.

Air Tourists Boost International Trade

Encouraging Americans to fly abroad on U. S. flag carriers is a vital means of increasing international trade, Air Transport Assn. reports.

U. S. tourists spent more than $1 billion in foreign countries during 1952—more than those nations earned from any U. S. import except coffee, Adm. E. S. Land, former ATA president, points out in a letter to Clarence B. Randall, Chairman of the Commission on Foreign Economic Policy.

Outlining ATA's position on the problem of expanding international trade, Land says air tourist travel is one of the "feasible methods" for increasing the dollar earnings of foreign countries.

Great Britain and France earned more dollars from American travelers than from any other single source, he says.

Civil Aircraft, Engine Shipments

	October 1953	September 1953	October 1952
Complete aircraft	235	359	293
By weight of airframe			
Less than 3,000 lb.	208	333	245
3,000 lb. and more	27	26	48
By number of places			
1- to 5-place	208	333	245
More than 5 places	27	26	48
By total rated hp., all engines			
Up to 399 hp.	208	333	245
400 hp. and more	27	26	48
Total value of completed parts (000 omitted)	$28,487	$30,287	$30,162
Aircraft total	20,236	21,047	19,927
Less than 3,000 lb.	2,034	2,937	1,815
3,000 lb. and more	18,202	18,110	18,112
Aircraft parts	8,251	9,240	10,235
Total of aircraft engines and parts (000 omitted)	$15,489	$15,071	$13,381
Aircraft engines	8,083	7,221	3,888
Engine parts	7,406	7,850	9,493

Civil Plane Shipments Drop 14%

Civil aircraft industry shipped 235 planes valued at $20.2 million and weighing 811,000 lb. during October, a joint report of the Census Bureau and Civil Aeronautics Administration reveals.

This was 14% below September shipments of 359 planes valued at $21 million.

The industry also shipped 494 engines with a total of 463,300 hp. This is a 6% increase in number of engines and 11% increase in horsepower over September shipments of 465 powerplants totaling 418,100 hp. October civil engine shipments were valued at $8.1 million.

Unfilled orders for civilian planes of 3,000 lb. airframe weight and over amounted to 358 at the end of October, about equal to the backlog at the end of September.

The report shows 3,609 civil aircraft totaling 8,573,800 lb. shipped during the first 10 months of the year. Value of the shipments amounted to $182.6 million, compared to $164.9 million for the same period of 1952.

FIRE and HEAT DETECTORS by Iron Fireman

Here is the patented design of Iron Fireman's special thermostatic switches for aircraft. Dependable temperature sensitivity is achieved by making use of the differing expansion rates of stainless and high-nickel steel.

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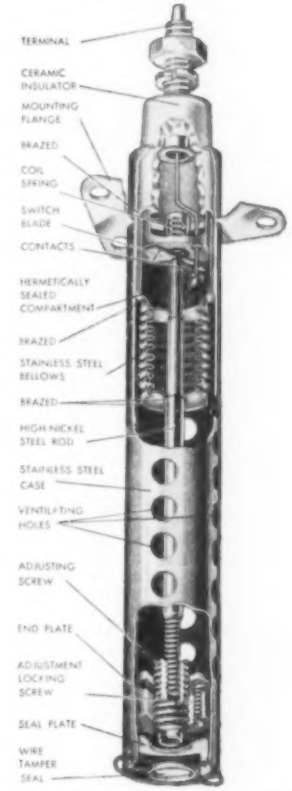

These Types Available: Single or two terminal models. Direct or reverse-acting contacts. Temperature settings: 65° F. to 1000° F.

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(Advertisement)

Valve Talk

for WM. R. WHITTAKER CO., Ltd.

by Marvin Miles,

Senior Member, Aviation Writers Assn.

When Whittaker first received customer specifications for a power boost master brake cylinder, the Southern California valve concern rolled up its sleeves and went to work.

It took six months of design and development to do the job — and do it right — with a half dozen major changes, almost as many prototypes turned out, and more than 100 hours of exhaustive testing before Whittaker's perfectionist experts were satisfied with the braking unit offered today.

By way of explanation, they tell me that the need for a power boost cylinder was created by the limitations of the human shin bone which today must be exerted almost to breaking point to stop a heavy, high-speed jet fighter on landing roll if no "assist" is available.

Yet weight on a fighter is all-important and it wouldn't do to load a ship down with a full auxiliary power brake system and the weight penalties it would impose. Hence Whittaker's compromise in the power boost master cylinder that gives positive and instantaneous action although it weighs but an average of 1.85 lbs.

The beauty of Whittaker's unit — developed at an initial expense of some $15,000 — is that its engineering has been standardized to the point of extreme flexibility wherein it can be fitted into any needed application. In other words, slight changes can be made to meet most boost pressure and displacement requirements. A vital sales point, for there will be no delivery delay due to design time.

Furthermore, the power boost brake has been fully tested, not only by Whittaker, but by several major companies which have put the unit through the rigors of complete functional studies.

To Whittaker's assistant chief engineer, Rod Campbell, goes much of the credit for developing this unit. By applying his patented pressure balanced dual poppet assembly (presently used on all Whittaker Pressure Reducers) to a master cylinder for boost control, he has come up with an entirely new unit.

Many times in talking with engineers I've found myself floundering neck deep in technical explanations. Nor was Rod's discussion any exception.

For example, he jumped right into terms such as "hysteresis" which may be clear to you, but didn't mean a thing to me until he explained it with a simple "Model A" definition — "friction." It seems the power brake cylinder's boost valve is designed to hold hysteresis to a minimum.

In addition, he continued, the double poppet valve functions through a full range of normal and emergency action, and the unit develops increased pressure in direct proportion to the force applied by the pilot, or in any ratio desired.

Pressures produced by the power boost valve portion are so balanced that the reaction to the master cylinder demand is instantaneous in proportion to applicating force applied to the toe pedal.

If the boost pressure should fail, due to the loss of hydraulic system pressure, increased pedal force will produce sufficient braking pressure through the master cylinder alone to control the stopping of the airplane.

Rod showed me the braking action on a dimensional drawing. He spoke of less internal leakage, held to minimum allowable requirements. And he pointed out that the normal flexure of high pressure hose connections does not affect the function or action of the brake valve.

"You will notice," he said, "that the valve boost pressure portion is identical to Whittaker's standard Pressure Reducer which has been fully qualified for some time, and its action is the same as the Power Brake valve used on several comparatively heavy aircraft.

"Furthermore, you can hang on a parking brake system with the addition of a small capacity compensator and linkage locks . . ."

Not being too mechanically minded, I accepted Rod's word for all this. And you would, too, if you could hear the enthusiasm in his voice for this new Whittaker product.

It's enough for me to know that Whittaker built the unit and guarantees without question that it will do the job specified — stop a fast rolling aircraft under normal or emergency conditions when the pilot tromps on the pedal. Furthermore it's standard, it's flexible enough to meet all requirements, it's priced right and it's available when needed.

What more can be asked? Oh, yes . . . there's a picture of it and some more technical information in Whittaker's ad on page 48.

Temco Increases Twin Navion Weight

A 400-lb. increase in the gross weight of Riley Twin Navion business planes is possible with modifications worked out by Temco Aircraft Corp., Dallas, Tex., the firm handling conversions of the plane to twin-engine configuration says.

With the new gross weight of 3,350 lb., the Twin Navion has a useful load of at least 1,000 lb. in addition to accessories, including normal radio equipment.

The modifications, which involve strengthening the airframe and landing gear to take the increased weight, will be made on Lycoming 150-hp. models. Earlier Lycoming 140-hp. Riley Twin Navions can be modified to take the more powerful engines and the higher weight, Temco states.

Conversion of the 150-hp. Twin Navions can be made by Temco in less than a week, later this time will be cut to three days as soon as a stockpile of replacement parts is built.

New Air Ambulances Sought in Australia

(McGraw-Hill World News)

Melbourne—Australian flying doctors and air ambulance operators are looking for airplanes suitable for conversion to their particular specialty, following a series of crashes involving aged de Havilland Dragon biplanes used for this purpose.

A comprehensive survey of planes is to be made abroad. Australian federal and state governments are being asked to provide assistance in financing this re-equipment.

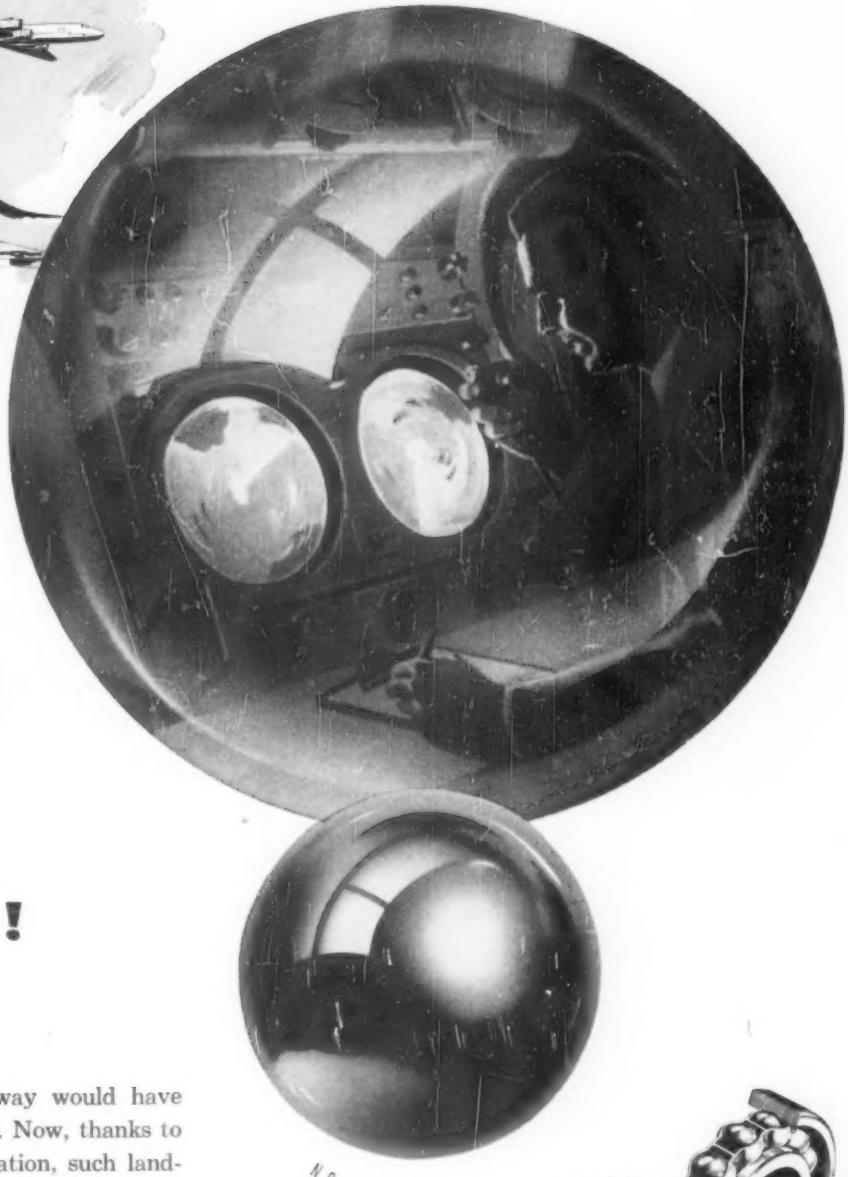
India Buys GCA

Bombay International Airport will soon be equipped with Bendix Ground Control Approach radar costing between $500,000-$1 million. The initial installation will be followed by further orders from the Indian Government if the equipment is found to be necessary.

Mooney Four-Placer Price-tag: $9,995

Mooney Aircraft, Inc., Kerrville, Tex., has received orders for 117 of its new four-plane Model 20 (AVIATION WEEK Aug. 31, p.8) against initial production plans for 150 scheduled for this year. The company announces that its four-placer will cost $9,995 fly-away factory. Price includes standard instruments, combustion heater, controllable pitch prop and omni antennae.

Bendix ground-control system makes "blind" flight possible, uses high-precision New Departure **ball** bearings.



"sight" for blind flight!

Landing on a fogged-in runway would have been a stunt not too long ago. Now, thanks to great advances in instrumentation, such landings are routine. New Departure has kept pace with these improvements, utilizing the most advanced methods and equipment for the manufacture of instrument bearings to ultra-precision specifications. Wherever you look in the expanding fields of instrumentation—defense or industrial—you'll find New Departures on the job—preserving super-accurate alignment . . . increasing efficiency . . . cutting friction . . . making compact, lightweight designs possible. Look to New Departure for fine **ball** bearings.

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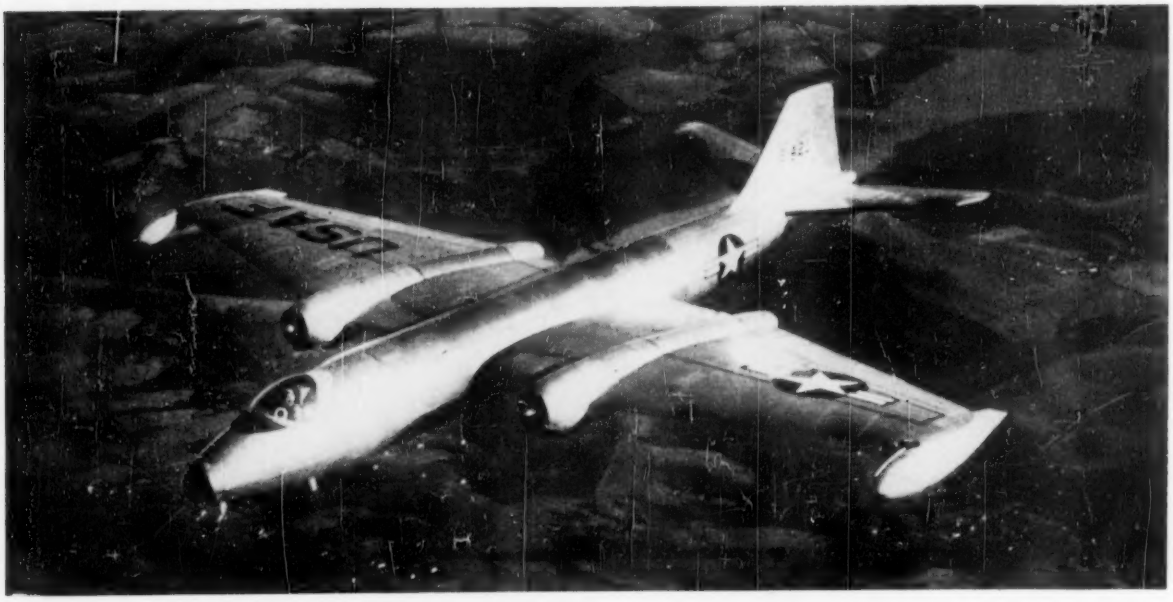


Martin Boosts Canberra Performance

By simple fixes, such as improved gap sealing, company has added 30 knots to speed of B-57A before buffeting begins.

By Irving Stone

Baltimore—In the transition of English Electric Co.'s Canberra bomber design to USAF's B-57A night intruder version, Glenn L. Martin Co. has stuck very close to the plane's basic configuration. This was an Air Force requirement.

In addition to routine conversion changes (AVIATION WEEK July 23, 1951, p. 19), there have been alterations for performance improvements, that have paid big dividends. These improvements have been effected with comparatively little expenditure of effort and time.

O. E. (Pat) Tibbs, veteran test pilot and Martin's manager of flight tests, probably is more familiar with the comparative performances of the B-57A and the Canberra than any other U. S. flyer. In an interview with AVIATION WEEK, Tibbs and other Martin personnel commented on some of the performance detail changes general aspects of these planes.

▶ **Exploiting Potential**—Tibbs believes the B-57 has great potential for future development. It compares, he contends, with a lot of fighters in maneuverability and its ability to operate at extreme altitudes.

At low speeds, because of comparative light wing loading on the B-57, stall can be approached closely and recovery made with minimum loss of altitude. It is this characteristic of the plane that increases the pilot's willingness to take advantage of its maneuverability at low speed, Tibbs says.

One example of how the plane's potential can be exploited is revealed in a simple airframe sealing job Martin has tried. This refinement has given the J65-powered B-57A a Mach .09 speed increase at high altitude before reaching the degree of roughness experienced with Britain's Canberra, Tibbs says.

Martin has tested the Canberra up to the maximum weight at which the B-57 is flying. Actually, this was an overload condition for the Avon-powered Canberra. This arrangement has given a pretty good idea of performance comparison for the two planes, Tibbs says. The additional thrust of the J65s is giving the improvements expected.

▶ **Control, Cockpit Features**—Control forces are slightly lower on the B-57s than on the Canberra, Tibbs reports. This very desirable condition probably stems from a better aileron sealing job obtained in converting from British to American standards, plus the fact that the three control surfaces—elevator, aileron, and rudder—have slightly lower spring rates in the tails.

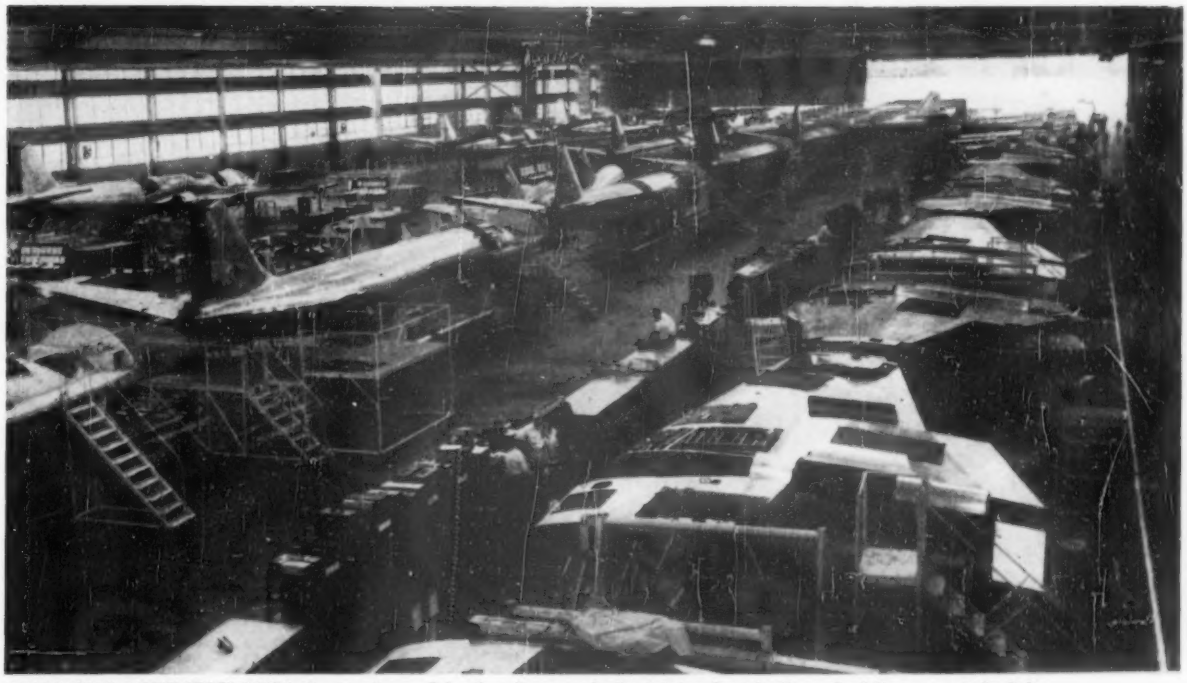
The general cockpit arrangement in the B-57A far exceeds that of the Canberra in conforming to U. S. standards of today, Tibbs says. Albert J. Perry, project engineer on the B-57A, reports that all American equipment has been installed and the arrangement changed for panels, control wheel, etc.

The radio operator-navigator, normally seated almost directly aft of pilot in the Canberra, has been eliminated and this space replaced with an equipment area. This leaves two crew members in the B-57A—pilot and navigator, who also is a general assistant.

▶ **Cooling, Brakes, Canopy**—Air conditioning in the cockpit is another feature of the B-57A. Tibbs says he saw the need for air conditioning as soon as he flew the Canberra, where cockpit temperatures could reach 140F.

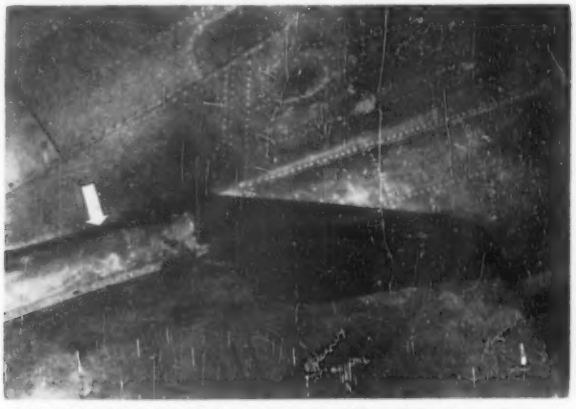
In the Canberra, the only cooling to relatively hot air from the compressor bleed is what is obtained in the ducts between the bleed point and the cockpit. At low altitudes, therefore, the cockpit can be very hot. The single small ventilator employed was not adequate.

The British have been forced to put

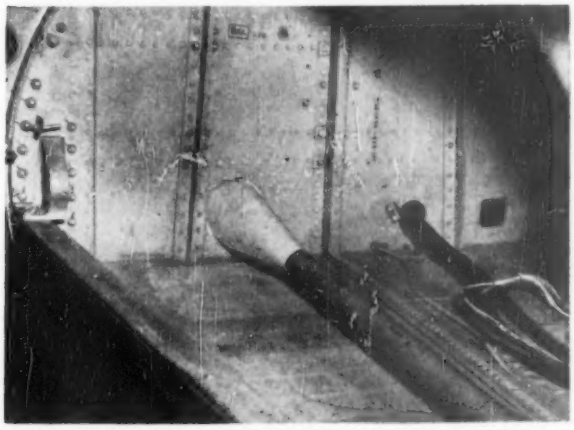


B-57 FINAL ASSEMBLY AREA shows wing and fuselage lines ready for joining for trip down final line seen at far left.

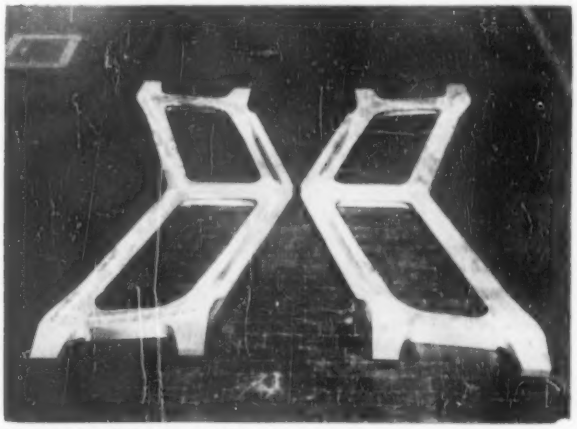
PRODUCTION SEAL is rubber-covered bent steel wiper strip (arrow). Chordwise gap at stub is made narrower.



TEST SEALS for stabilizer: tape on inboard leading edge gap (torn during trial) and compound (arrow) at fuselage.



ELEVATOR ROD in test is sealed with paper cone where it comes through bulkhead. Tape seals floor holes.



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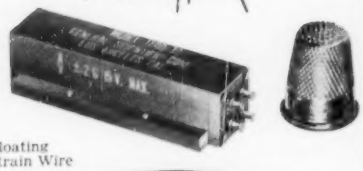

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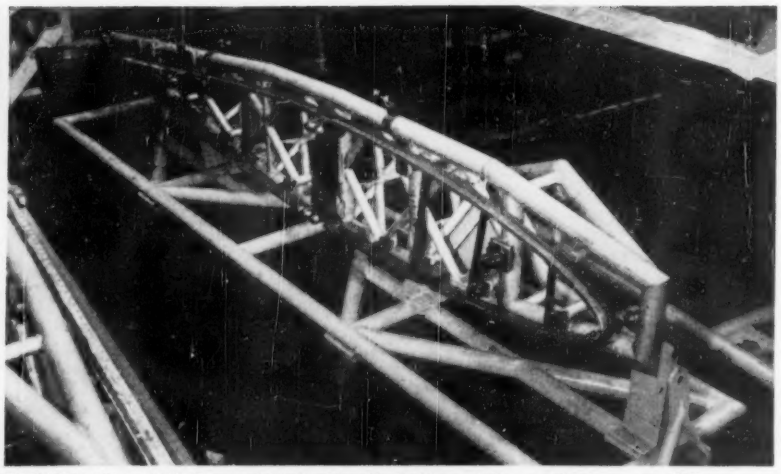

WING ROOT HOLES are drilled with aid of this periphery tool shown on dolly.

PERIPHERY DRILLING TOOL for fuselage locates holes for match angle.

an air conditioning unit in Canberras used in tropical climates. Reports are that air conditioning also is being added to late-model Canberras. Lack of air conditioning in earlier Canberras may be attributed to a difference in design philosophy or simply to a belief that it was not needed.

Tibbs sums up the situation this way. Air conditioning makes the difference between sitting in a sweat box and in an air-conditioned office.

Toe brakes on the B-57 make ground handling of the plane much easier, according to the flight test manager. On the Canberra, a hand brake is used, actuating both brakes, with differential braking obtained by rudder action.

A new canopy is scheduled for a later version of the B-57—probably the B model—and is expected to improve visibility. This new type canopy has been mocked up and flown on a Martin-operated Canberra.

► **Rotary Bomb Bay**—Another big improvement already incorporated in the B-57A is the substitution of Martin's rotary bomb door for the conventional clamshell type (AVIATION WEEK Aug. 3, p. 17). Tibbs' view is that something had to be done to bring the perfection of bomb dropping up to the performance of aircraft. He says the new bomb door makes the old type arrangement completely obsolete.

During the brief time of bomb door rotation, there is only a slight buffet. After the door has been rotated to open position, the effect is as if the door still were closed, Tibbs reveals. The rotating door will permit bombing runs at the same speed as fighter-bombers drop their externally carried weapons. No longer is the pilot of the bomber restricted by the gaping bomb bay and associated turbulence.

Tibbs' views, in the main, are shared by Perry, who says turbulence has been a very serious problem with the old type door—even at low speeds, where bomb-dropping characteristics have been affected.

The rotary bomb doors were proven on Martin's XB-51 before adoption for the B-57A. The XB-51 tests successfully showed inherent advantages of the rotary bomb door for high-speed bombing runs.

In all probability, the new type door is slated for future planes and is likely to be adopted by other builders.

► **Increased Speed Limits**—Of all the

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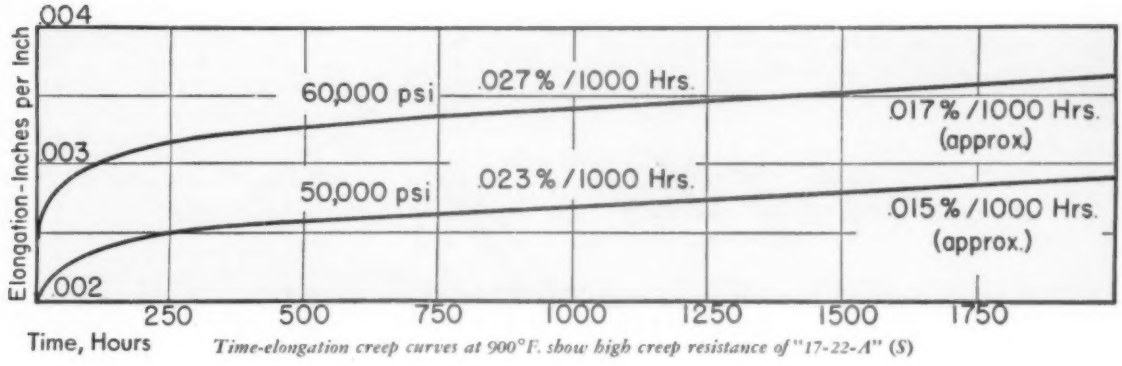

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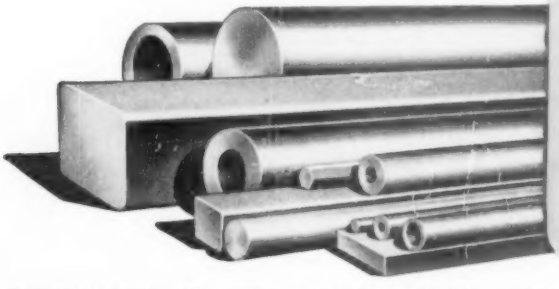

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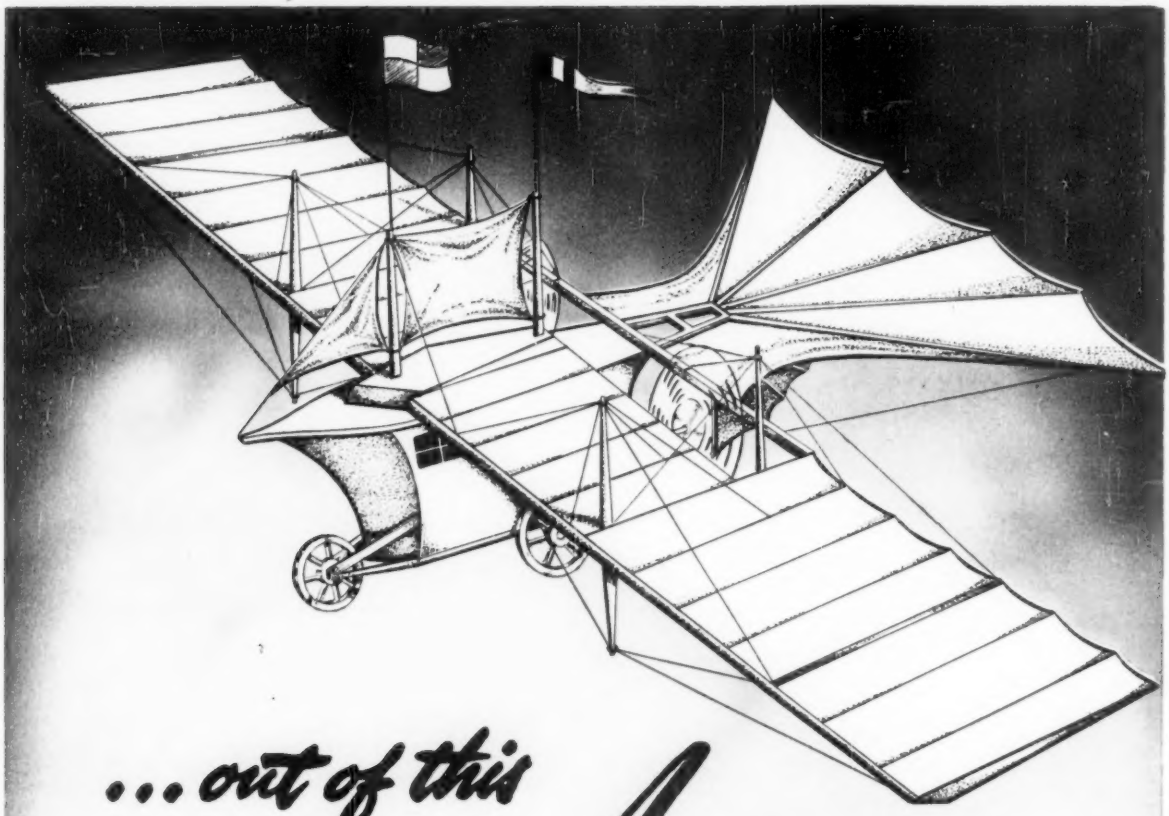

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changes made in the transition of the Canberra to the B-57, the most important probably is the increase in the plane's critical speed limits. Martin engineered the change in an ingenious and inexpensive development program.

Martin's Engineering Division initiated the program to obtain greater potential for the plane by extending its proved limits of normal control. The job fell to the aerodynamics and flight test departments, with Howard Schick, aerodynamic representative on the B-57A project, and Tibbs handling the responsibility for the task.

The Canberra, like any other plane, is limited not by power and weight but by proved limits of normal control. Limit of normal control may be defined as a combination of speed and altitude conditions beyond which control of the plane is uncertain.

The prime limiting factor of Martin's first production B-57A (there was no prototype, as such) was a low-frequency buffet. This condition also occurred with the Canberra. The buffet manifested itself at comparatively low altitudes and at a speed considered too low to tolerate. The buffet affected the entire bomber, but was traced to the tail by means of instrumentation.

▶ **15-Knot Gain**—To remedy the condition, Martin engineers adopted an "opportunist attitude" instead of the usual time-consuming scientific approach involving windtunnel trials, calculations and other detailed procedures, Schick reports.

The method used to obtain the improvement was to seal the tail section, both internally and externally. English Electric did some work on internal sealing in the tail and, on test aircraft, resorted to stiffening the fuselage to overcome the buffeting effect. Martin engineers wanted better results and wanted them quickly.

To expedite flight test results, Martin engineers used tape to seal lightening holes and access openings. For example, a paper cone, taped in place, was used to seal the opening where the elevator push-pull rod came through the fuselage tail bulkhead. On the basis of the favorable results obtained with the sealing in the tests, metal-and-rubber production seals were engineered for these same applications.

Translated into actual speed values, the internal sealing resulted in a delaying action of 10 to 15 knots indicated airspeed in the appearance of the low-frequency buffet, Schick reveals.

▶ **Extra Dividend**—Another speed dividend was obtained through external sealing.

The trim method on the B-57 is by stabilizer adjustment. This method is used because a reasonable size of trim tab and trim deflection would not be adequate when compressibility ef-

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fects are encountered. A movable stabilizer provides adequate trim at any foreseeable speed for this plane.

Utilization of this moveable arrangement involves gaps and unsealed openings at and through the fuselage. To reduce the open areas for further improvement of airflow characteristics, Martin engineers sealed the stabilizer at two locations.

One of these locations was on the quarter-round fairing between the horizontal stabilizer and fuselage cone.

To facilitate test results, the plane was flown at the high-speed trim condition and landed with the stabilizer in this position. The gap at the quarter-round fairing was filled with a sealing compound and the plane taken up with the stabilizer so sealed. Results indicated that a speed dividend could be obtained in buffet delays.

Still another point of sealing was at the small stub fairing at the leading edge of the stabilizer close to its junction with the fuselage. Two gaps were involved here—one chordwise, one spanwise. These gaps were sealed with waterproof adhesive tape for the test evaluation.

This external sealing resulted in another 15-knot increase in speed before the low-frequency buffet occurred, Schick says. This improvement, added to that obtained through internal sealing, gave the first production B-57A a 30-knot advantage over its British counterpart.

▶ **Improvement at Altitude**—As a result of this study for the low-altitude (under 10,000 ft.) buffet problem, an increase of Mach .09 at high altitude (over 30,000 ft.) is obtained over the accepted RAF limit for the Canberra on compressibility effects. This is a dividend obtained with no extra effort except that of making the improvements which were considered necessary for the low-altitude condition.

Seals used on the test runs are being replaced with production types. On the quarter-round fairing, a spring-loaded seal extends the entire length of the fairing's surface. On the stub fairing, production seal is being obtained by incorporating a reduced gap on the chordwise length, whereas the spanwise gap is being fitted with a felt filler strip, Schick reports.

▶ **Wing Fitting Change**—Despite the fact that the B-57A was to follow the Canberra design very closely, it was known from the beginning that certain changes would have to be made in the aircraft.

One major change was in the "garden gate"—the wing spar carry-through fitting. On the Canberra, this fitting was hogged out of a large forging. Martin engineers did not want to have the part hammer-forged or press-forged in sections, because they did not consider

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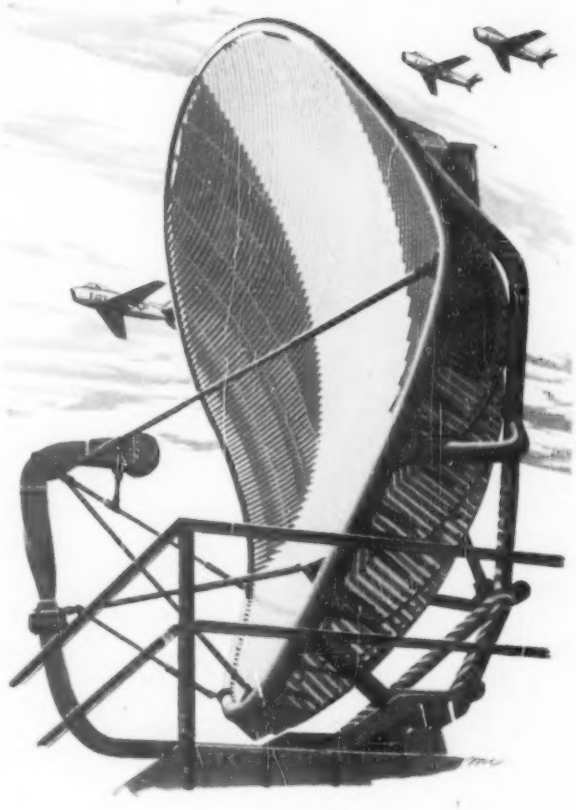

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this approach feasible for production.

It was found cheaper and quicker to create a corresponding structure from two 3-in. rolled 75ST plates—fore and aft sections. The structure's configuration is cut out and then machined.

It is possible that when the new large presses under the Air Force heavy press program begin operating, the "garden gate" fitting again may take the form of a single large forging. Martin already has proposed this makeup.

▶ **System, Accessory Change**—Some system changes also were made. The hydraulic system was redesigned to a "normal" installation as used on USAF planes. Pressure is 3,000 psi., higher than that of the British plane. The system change was made primarily so that U. S.-manufactured equipment could be accommodated.

In the fuel system, Martin altered the Canberra wing (B22/48) to provide for the installation of guns outboard of the nacelle at the leading edge.

Generator and hydraulic pump on the Canberra are located in the inboard portion of the wing leading edge, driven through a shaft takeoff from the engine to a gearbox in the leading edge area. On the B-57A, the generator and hydraulic pump are mounted directly on the engine, following U. S. practice.

▶ **Production Procedures**—The wing-to-fuselage mating posed a considerable problem in Martin production. This mating job involved the wing spar-to-garden attachment, fore and aft wing fitting attachment, and periphery mating of wing-to-fuselage. This latter operation was complicated further by a compound mating contour. The periphery junction involved about 300 bolts for each wing panel.

The British method for doing the job was to pilot-drill the wing previous to final assembly and use it as a tool (template) to accomplish the peripheral drilling on the fuselage attaching angle in final assembly.

Thus, while the wing was matched to the angle, the pilot holes were enlarged to full size on both the wing and the attaching angle. The wing was removed and anchor and strip nuts riveted to the fuselage angle. The wing then was bolted on.

This comparatively simple method was acceptable considering the British orders for the plane. While it did not involve any tolerance accumulation problem, it did mean drilling, where not advisable by U. S. standards.

Martin wanted to cut the final assembly stations by doing routine drilling elsewhere, according to Stanley F. Bond, Martin's chief of tooling, plant 2. Also, the order for the B-57A, obviously considerably larger than the British quantities, justified a greater expenditure on tooling.

▶ **Steps Eliminated**—Martin did the job this way: Holes were drilled full size in the attaching angle, and angle and strip nuts attached; wing holes were drilled full size; wing and fuselage mated and bolted up.

With this approach, one drilling operation involving about 600 holes was eliminated. The drilling operations were done prior to final assembly, reducing its final operation to a nut-and-bolt button-up, Bond says.

Another beneficial consideration was that Martin's pre-drilling was done in a low-bay area and not in the final assembly high-bay area where height as well as length of factory area is a premium factor for complete airplane accommodation.

▶ **Aluminum Tooling**—For tooling, Martin first made a master dummy fuselage side and from this produced a peripheral tool for locating (and drilling) the match angle at the fuselage. (The garden-gate and fore and aft wing fittings previously had been located independently on the master fuselage dummy.)

Martin also made a master dummy wing root, and built a peripheral drilling tool to drill the wing.

Normally, master tools are made of steel and involve dimensional coordination problems that can be traced to differences in coefficient of expansion between tool and aircraft material.

For this reason, Martin built the master dummy from the same aluminum alloy material to be used in the wing, fuselage angle and fittings. This minimizes the problem of differential expansion between tool and aircraft, which could have been serious in view of the long length of the wing attachment, Bond contends.

Building the dummies of aluminum alloy also was important with respect to spares, which would be expected to mate accurately under different temperature conditions than when each was drilled (parts are worked at separate times usually, hence temperature conditions probably are different).

Shielding Need Bars Atom Plane Progress

Aircraft powered by nuclear reactors are technically feasible, but such aircraft are not likely for the near future. Those are the views of Dr. William E. Parkins, chief of reactor engineering at North American Aviation, Inc.

Parkins told a recent meeting of the American Rocket Society (Princeton group of the New York Section) that the most important limitation in the development of nuclear aircraft is the problem of shielding the crew from the radiation of the reactor in the aircraft.

▶ **Shielding Problem**—There is no way

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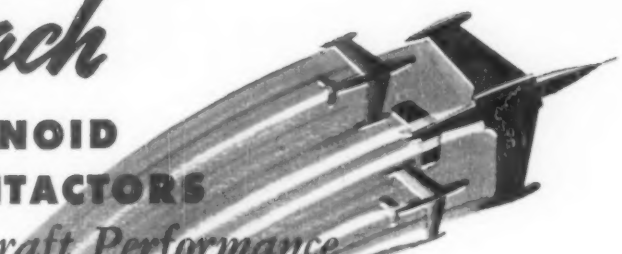

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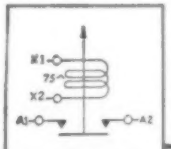

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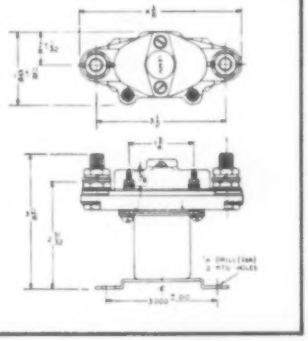

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Rating—200 amps resistive and motor load at 29 v d-c, 100 amps inductive at 29 v d-c.

COIL:
75 ohms, 24 v d-c continuous duty. Pick-up—18 v d-c max. Drop-out—7 v + 0, —5.5.

WEIGHT:
1.225 lbs. approximate.

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CONTACTS:
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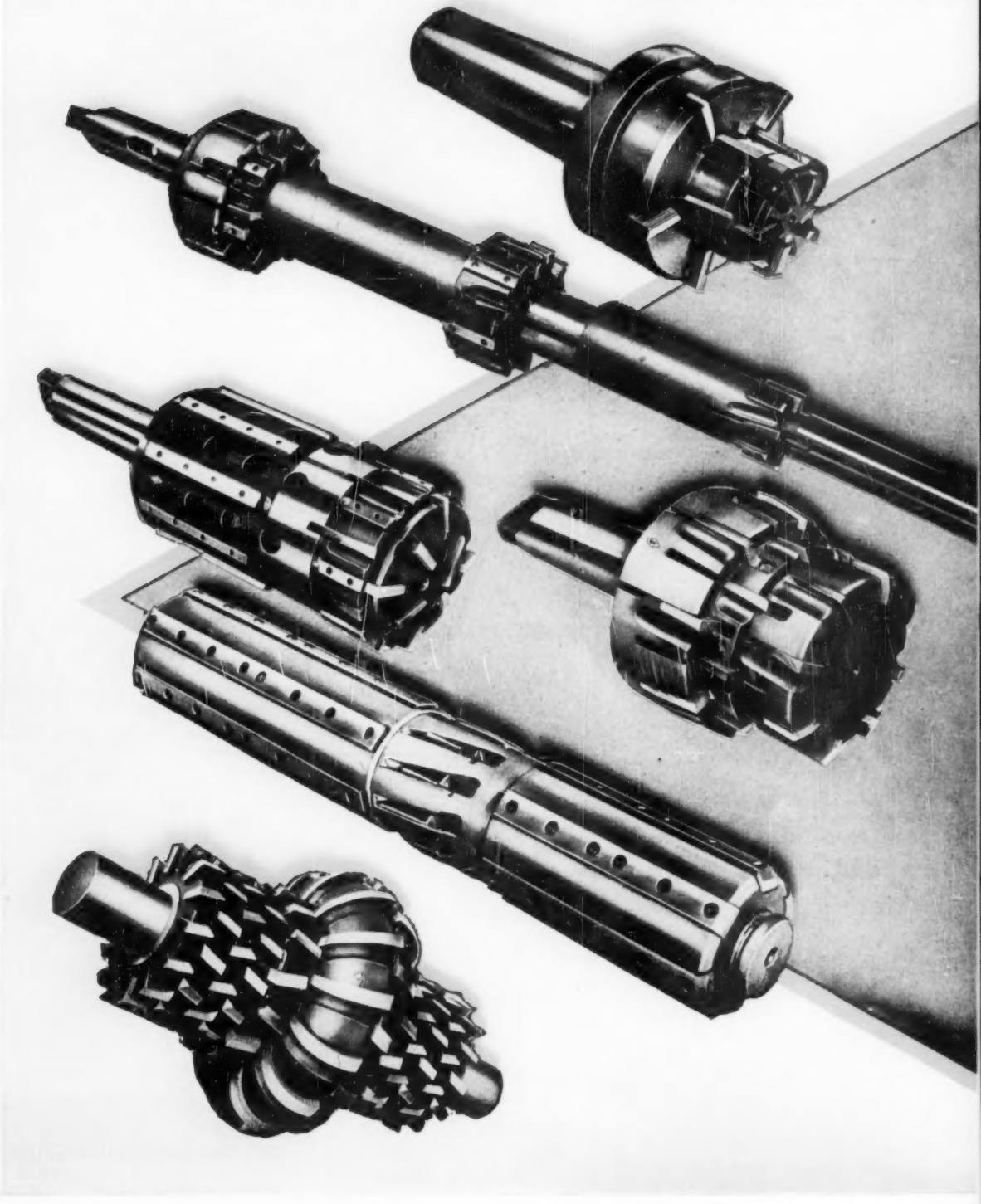

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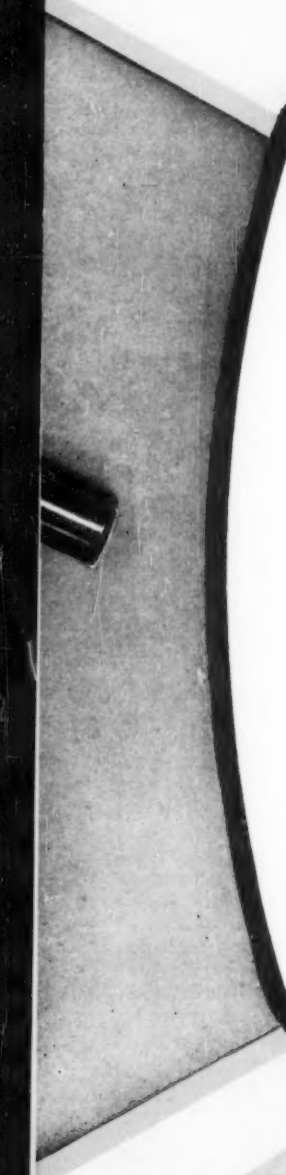

one-pass OK multiple diameter tools

Over fifty percent of O K tool orders from the aircraft industry are for combination cutters, designed to perform two, three and four operations with one pass of the tool. These tools take bulldog-bite rough cuts, or cobweb-thin, micro-finish cuts, with no restrictions as to metals, which run from stainless steel for jet-engine parts to heat-treated aluminum for cylinders and high-speed steel for triple-step lathe chuck jaws. Former production records are demolished! Where, yesterday, five pieces on the floor, was considered good; today, you find 50 pieces, inspected and passed.

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in the new AMPHENOL CATALOG B-3

The new AMPHENOL B-3 catalog has just been released. The B-3 is designed to give general information about the entire AMPHENOL line of quality components—AN connectors, RF connectors, coaxial cables, sockets—everything made by AMPHENOL is concisely described and illustrated. From the B-3 you will be able to choose the components you need for quality electronic equipment.

At AMPHENOL there is a constant concern with quality. In design, engineering and production this AMPHENOL *emphasis on quality* produces quality components for the electronics industry. New ideas are a major AMPHENOL contribution to electronics. Connectors and cables with application possibilities thought impossible a few years ago are made by AMPHENOL today.

The B-3 catalog also gives a complete listing of special catalogs and bulletins that will prove of value where more specific information is required on AMPHENOL components.

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of eliminating such shielding with existing or planned high-energy nuclear reactors, he said. Shielding for alpha and beta radiation would be light, but for gamma and neutron emission would require materials like boron, lead, concrete, water or any other heavy element or compound.

Parkins said that the problem of power-reactor development and its application to aircraft propulsion is capable of solution within the existing framework of reactor technology. Guided missiles or pilotless aircraft powered by nuclear reactors would not need shielding, but there would be a new problem of launching or landing such vehicles in protected areas. For one-way missions, nuclear propulsion would hardly be economical, he thought.

▶ **Thermal Cycle**—Parkins favors the turbojet or ramjet application of nuclear power, in which the reactor is the heating element for air rammed or forced through a duct and ejected through an exhaust nozzle. He said that this would be the only practical way to apply the heat energy thoroughly. The use of a steam-generating unit to drive a turboprop combination was highly impractical, he thought.

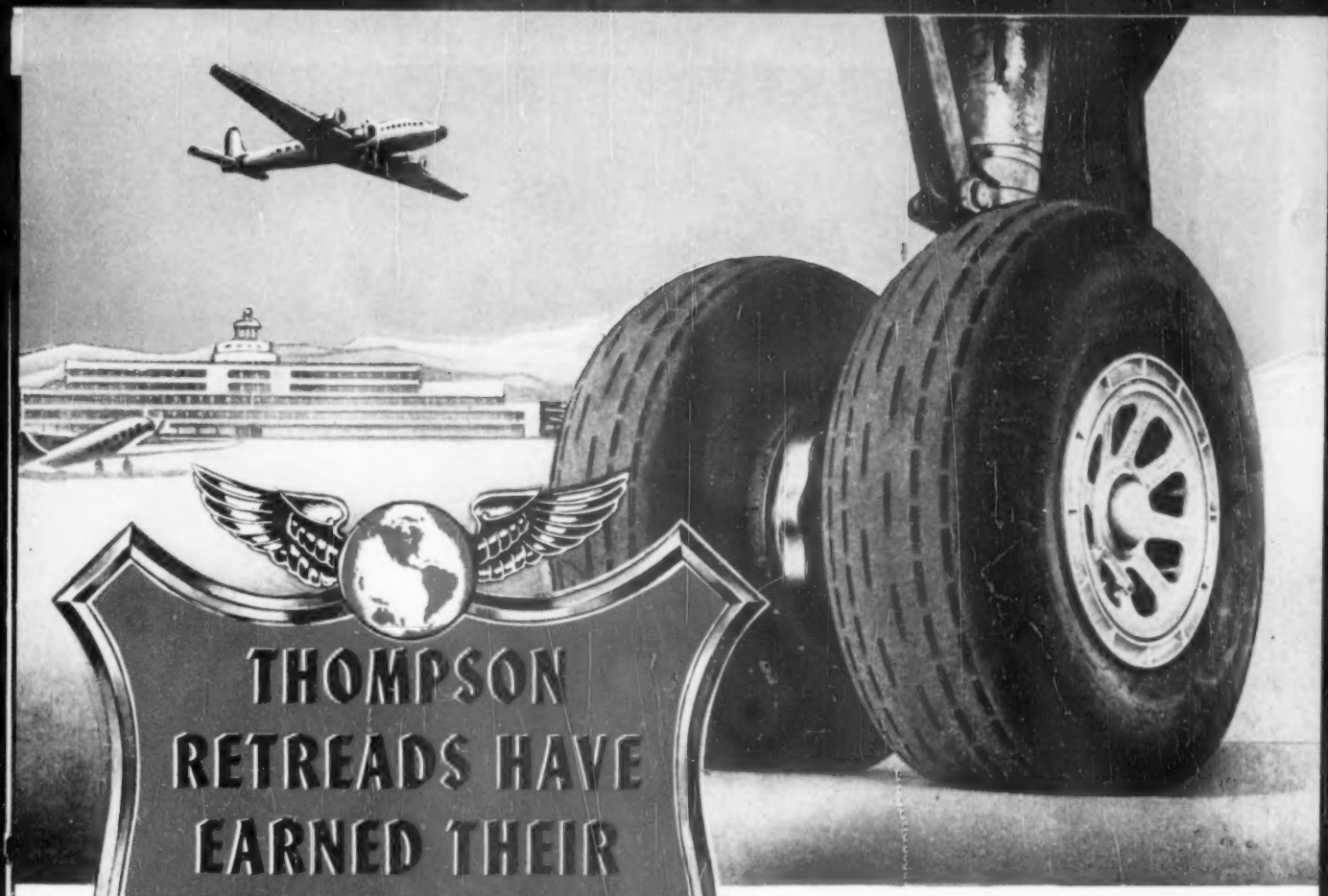
Parkins said that even though the application of the reactor as a heat-transfer device seems to be the only feasible method at present, it suffers from severe metallurgical problems. This comes from consideration of heat transfer, where the surface of the reactor must be at a higher temperature than the air or gas flowing through it.

Thus the working temperature of the reactor is a design limitation. Metals chosen for it must be capable of withstanding high temperatures and intense radiation densities in addition to having physical properties which would not interfere with neutron production inside the reactor.

According to Parkins, nuclear-powered aircraft would be very large and comparatively slow, but would have to be designed for extreme reliability and airworthiness. Any possible crash or failure of such an aircraft would result in very serious radiation hazards, especially in inhabited areas.

▶ **Stationary Powerplant** — Stationary powerplants using a nuclear reactor for the production of electrical power could be designed more economically than those for aircraft or submarines, said Parkins. Natural uranium could be used in a stationary reactor, which would also have cheaper shielding and moderator elements (which control rate of reaction). This would contrast with the enriched reactors for aircraft or submarine application which would have to be composed of large proportions of uranium 235 or plutonium.

Parkins said that liquid sodium



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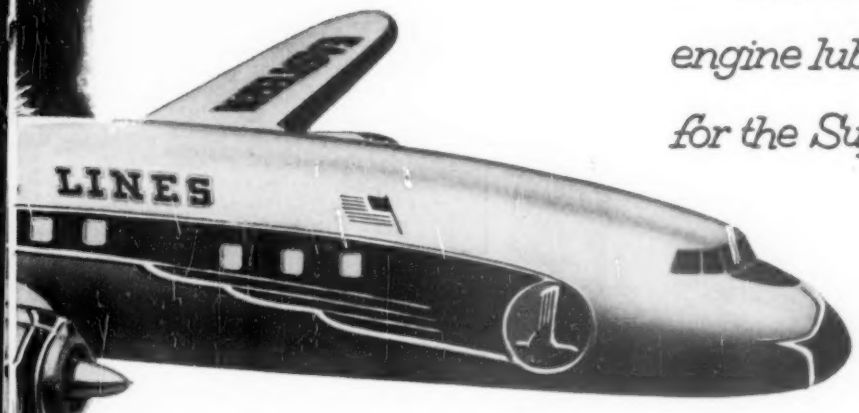

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would be the heat-transfer medium in a closed cycle for the stationary powerplant; the metal has been proven to be the best coolant and heat-transfer agent available which will not disturb the nuclear processes within the plant.

▶**Cheaper Power**—Power production cost with the nuclear reactor was estimated at 7.9 mils per kilowatt which compares to a quoted figure of 7.41 mils per kilowatt for existing conventional steam power-generating plants.

But while further development in present steam equipment is probably limited, said Parkins, nuclear powerplants are at the beginning of their development life and will definitely become more economical as time passes.

North American's small reactor could be used for mobile or small generating stations especially suited to the needs of the Corps of Engineers in remote areas such as the Arctic or the Pacific Islands.

Government control and subsidies will be required for a long time to come; if nuclear weapons are still a necessity for the country, stationary reactors could be designed to produce plutonium as a byproduct for sale to the government. In this way, a subsidy could be established much as present postal subsidies have to support the commercial airlines, Parkins said.

Plutonium would not be a byproduct of aircraft reactors; such a reactor would probably be a user of plutonium instead, Parkins added.

▶**New Era**—Parkins said that during the next few years, foundations would be laid for the peaceful applications of nuclear energy for power production, isotope and radioactive tracer production and nuclear-propelled aircraft flight. He said that nuclear-powered rocket propulsion was not technically feasible within the next few years, primarily because of the unfavorable mass ratios which would result from the heavy shielding necessary.

Even an unmanned nuclear-rocket-propelled orbital vehicle is not likely because the required working temperatures would be much higher than those required for aircraft reactors, and would still be a limitation even if a feasible mass ratio could be obtained. No material now in existence or envisioned could survive the rigorous conditions required for a rocket reactor.

French Improving Djinn Jet Copter

A new rotor and more powerful gas turbine powerplant are among the modifications being incorporated in the tiny French Djinn helicopter to improve its performance, Sncaso, its maker, reports. Several versions of the craft, a prototype of which was demonstrated recently to French officials

(Aviation Week Nov. 23, p. 48), are planned.

The Djinn's new rotor will have a diameter of approximately 34 ft. The improved model's gross weight will be 1,390 lb., maximum speed will be 75 mph., economical cruise speed will be 37 mph., and service ceiling 10,000 ft., the maker estimates.

Three models of the Djinn are in the works:

- **Single-place,** having a range of 110 mi. and 132-lb. useful load.
- **Two-place,** with range of 94 mi.
- **Three-place,** fitted with two stretchers and having a range of 45-50 mi.

Sncaso, one of the nationalized French aircraft plants, is interested in developing the Djinn for commercial purposes, and has placed Maj. Boris, managing director of Helicop-Air, in charge of plans to promote sales of the copter in France and its possessions as well as other European countries.

Navy Contracts

Contracts recently announced by the Navy's Aviation Supply Office, 7000 Robbins Ave., Philadelphia 11, are:

Adel Div., General Metals Corp., 10777 Van Owen St., Burbank, Calif., hydraulic valve for various aircraft parts, 686 ea., $26,713.

AiResearch Mfg. Co., Div. of the Garrett Corp., 9851-9951 Sepulveda Blvd., Los Angeles 45, Calif., valve assy., $197,075.

Atlas Paint and Varnish Co., 50 Buffington Ave., Irvington, N. J., enamel, 31,400 gal., $34,783.

Barber-Colman Co., Rockford, Illinois, actuators, 110 ea., $42,928.

William Brand and Co., Inc., North and Valley Sts., Willimantic, Conn., wire, electrical 6,319,000 ft., $41,642.

Denison Engr. Co., 1160 Dublin Rd., Columbus 16, Ohio, valves, 44 ea., $26,732.

Electroline Co., c/o F. O. Hoyt Co., 1417 Sansom St., Philadelphia 2, Pa., connectors, $30,637.

Foote Bros. Gear and Machine Corp., 4545 S. Western Blvd., Chicago 9, Ill., spacer, flange and yoke, $35,709.

Hoover Electric Co., 2100 S. Stoner Ave., Los Angeles 25, Calif., actuator, 21 ea., $31,470.

Killington Mfg. Co., Inc., 90 Merchants Row, Rutland, Vermont, gloves, $58,163.

Philco Corp., 4700 Wissahickon Ave., Philadelphia 44, Pa., cable harness, test bench and waveguide kit, $107,069.

Purolator Products, Inc., 970 Brunswick Ave., Rahway, N. J., filters, $55,127.

Rhode Island Insulated Wire Co., Inc., 50 Burnham St., Cranston, R. I., wire, electrical, $82,441.

Scintilla Magneto Div., Bendix Aviation Corp., Sherman Ave., Sidney, N. Y., parts for engines, $65,868.

Sperry Gyroscope Co., div. of the Sperry Corp., Great Neck, N. Y., tools and test equipment, $144,176.

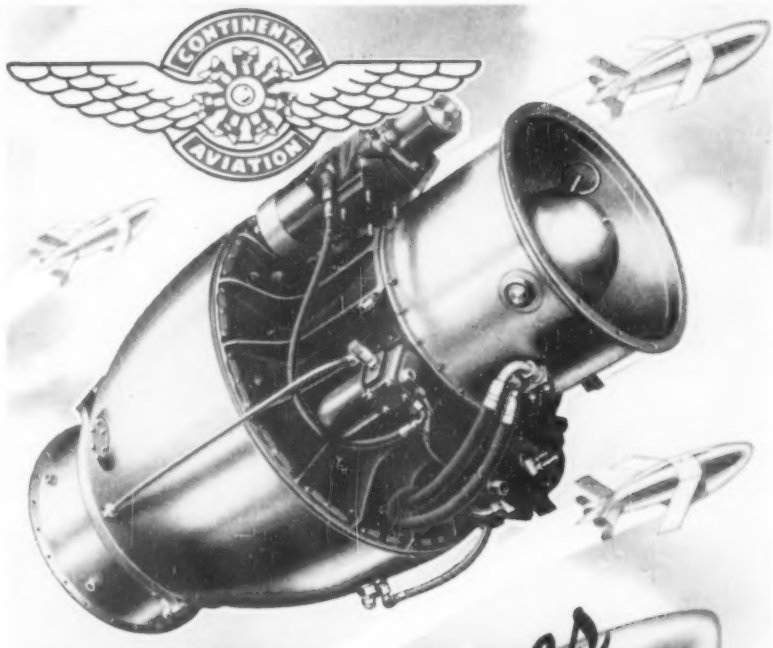
Suprenant Mfg. Co., 199 Washington St., Boston 8, Mass., wire, electrical, $27,595.

Turco Products, Inc., 95 Fairmount Ave., Philadelphia 23, Pa., compound, 9,500 gal., $27,637.

Vickers, Inc., 1400 Oakman Blvd., Detroit 32, Mich., hydraulic pump and spare parts, 114 ea., $104,746; hydraulic motor for various aircraft, $182,261.

Wm. R. Whittaker Co., Ltd., 915 N. Citrus Ave., Los Angeles 38, Calif., valve assy., 100 ea., $29,667.

Pratt & Whitney Aircraft Div., United Aircraft Corp., East Hartford 8, Conn., material for R4360-59 engines, $68,367; $2,100,388; spare parts for use on P&W engines, $29,063; $187,531; material for J57-P-1 engines, $534,563; $1,391,494.



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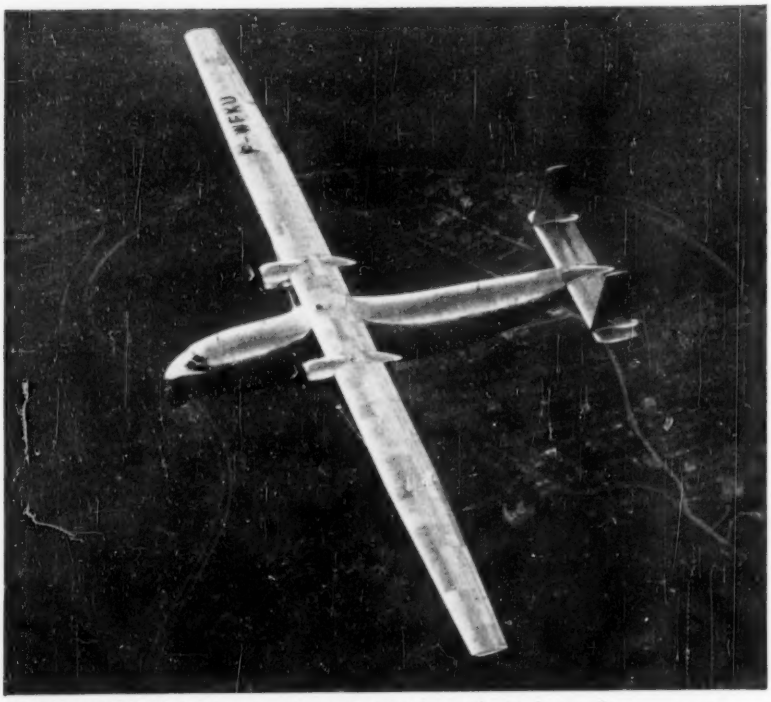


HUREL-DUBOIS H.D. 32 resembles H.D. 31 (above), but is longer, has more power.

High-Aspect-Ratio H.D. 32 Details

By David A. Anderton

Recent order for a fleet of Hurel-Dubois H.D. 32 high-aspect-ratio-wing transports by Air France spotlights again the unusual design layout of this plane.

The Air France order (AVIATION WEEK Dec. 7, p. 18), the biggest placed by the carrier with any French firm, underlines the technical worth of this wing, with its high ratio of span to chord.

The H.D. 32, now completing its flight-test work, differs in few particulars from its predecessor, the H.D. 31, which was analyzed in AVIATION WEEK Sept. 8, 1952.

A recent interview with Hurel and a visit to the Villacoublay factory of Avions Hurel-Dubois has provided these additional details on the new transport.

► **Other Engines**—Chief difference between the H.D. 31 and 32 is in the powerplant. The 31 uses a pair of 800-hp. Wright Cyclone C7BA1 engines; the 32 will be powered by two Pratt & Whitney R-1830-92 engines rated at 1,220 hp. each for takeoff.

The H. D. 32 will be about three feet longer than the H. D. 31 in the nose section. Inside the fuselage, the toilets will be moved aft behind a light bulkhead to make additional room.

Cruising speed at about 10,000 ft. is expected to reach about 180 mph.

Passenger capacity will be 42 seats which can be mounted to face either forward or aft. Available cargo space in the all-cargo version is about 1,765 cu. ft., which is on the order of 13,000 lb. for customary load densities.

► **Flight Demonstration**—The day was hot and still when AVIATION WEEK visited the Hurel-Dubois plant. The field at Villacoublay—which the French say is the oldest established airfield in the world—has a grass-surfaced strip where flocks of sheep graze between test flights. The maximum length of the grass strip is 3,000 ft.

To add to these environmental conditions, two pilots, strange to the airplane, were being checked out by Hurel pilot Max Fischl.

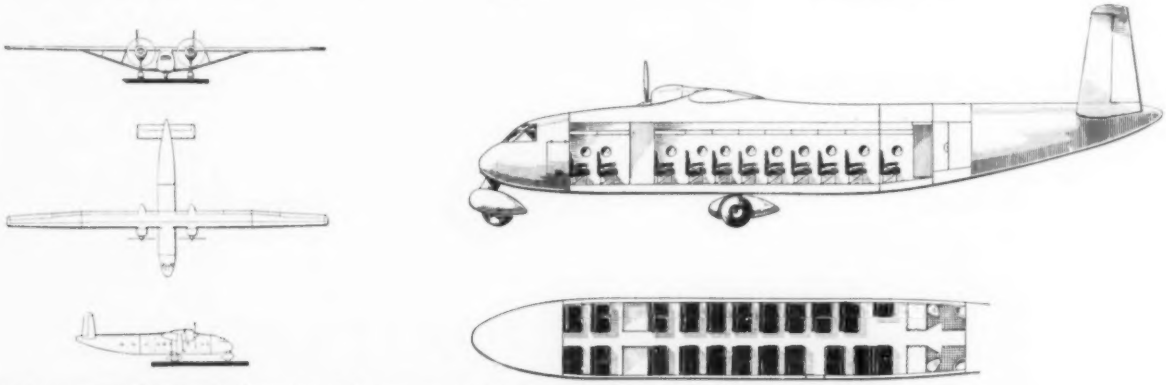
Takeoffs were made at normal gross weight; in each case, the plane was clear of the ground at a distance of 800 to 1,000 ft. from the start of roll.

On takeoff, the plane accelerated slowly and ponderously and its wingtips waggled as the tires rolled over the rough sod. Takeoff speed was about 80 mph., and the climbout angle was rather low. After slow circuits of the field, the final approach to landing was flat and slow. Touchdown was without flareout, and landing roll abnormally short.

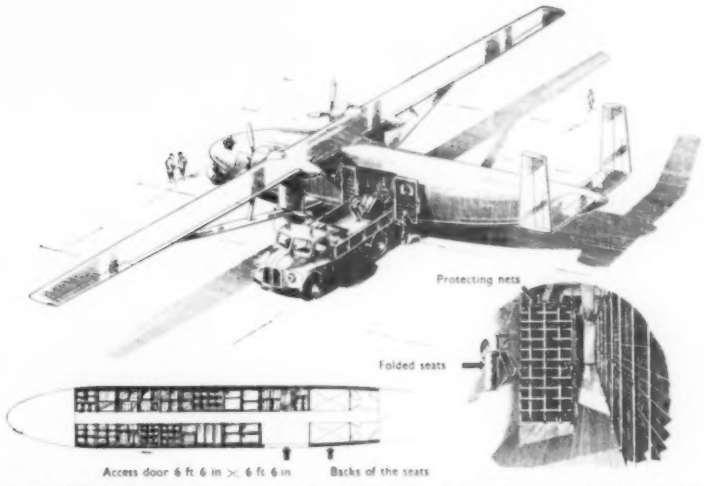
► **Factory Area**—The factory at Villacoublay is a joined pair of old corrugated iron hangars, with the names of famous French pilots of World War I —Bedel, Rose, Garros—emblazoned above the sliding doors.

Factory space is about 86,000 sq. ft. now, but ground has been cleared for an adjacent building with an additional 64,500 sq. ft. Hurel told AVIATION WEEK he planned the buildings to be used for prototype development and to have production of the transports done elsewhere, with up to 60% subcontracted.

Because of its abnormal ratio of span to length, the H.D. 31 is warped in and out of the hangar doors sideways, on a land-based equivalent of a marine railway.



H.D. 32 external layout in three-view (left); cutaway (right) shows rear-facing seats in passenger version.



CARGO VERSION of H.D. 32 has seats folded behind partitions, nets holding freight.

► **The Men**—Hurel is an old-time pilot and former seaplane designer with the French firm Cams. To prove his faith in the spindly wing (aspect ratio of 32.5) of the H.D. 10—a single-place test aircraft built to check Hurel's design ideas—he crammed his chunky frame into the tiny cockpit and made the initial flights.

Dubois owns a construction firm, one of the biggest in France. The company also has extensive interests in the colonies in North Africa. The earthmovers and trucks clearing the site for the H-D plant expansion belong to Dubois' company. Dubois money backed Hurel's ideas because of those colonial interests.

Hurel had originally laid out the design as a means of transporting freight at low costs. He planned a plane that would get into and out of unimproved fields, would cost very little to operate, and could be maintained easily.

Dubois believed he could use a design like that in his colonial enterprises, and the collaboration began. The Air France order gives Hurel the first tangible evidence that his arguments have held up in the cold light of cost figures.

Tax Aid for Engine Plant Expansions

Privately financed expansions of aircraft engine and engine parts facilities, encouraged by rapid tax writeoff benefits, totaled more than $524 million from the start of the Korean War in mid-1950 through June 30 of this year, according to figures made available by the Office of Defense Mobilization.

Requests in this period came to nearly $550 million for proposed expansions, while $370 million was certificated by the government for accelerated tax amortization.

In the tabulation that follows, the amount proposed for certification is followed by the amount certificated, and finally by the amount certificated for tax amortization. The figures given are in thousands, three zeros being omitted in each case. The figures for amounts proposed do not include requests that were withdrawn or denied. Authorized expansions of $50,000 or more are listed, but totals at the end of the list include all expansions, regardless of size.

Certificate for fast writeoff permits a property to be depreciated in five years.

- **Aero Engineering Corp.**, $144 (proposed), $93 (certificated), $60 (certificated for fast write-off).
- **Aircraft Precision Products Inc.**, $199, $176, $125.
- **Akron Presform Mold Co.**, $180, $172, $95.
- **Allied Products Corp.**, $519, $507, $322.
- **Alloy Products Co.**, $312, $265, $196.
- **Aluminum Co. of America**, $338, $338, $220.
- **American Bosch Corp.**, $492, $492, $320.
- **American Brake Shoe Co.**, $1,594, $1,451, $1,089.
- **American Non Gran Bronze Co.**, $231, $227, $168.
- **American Pulley Co.**, $490, $462, $300.
- **American Standard Products Co.**, $254, $254, 158.
- **American Welding & Mfg.**, $1,168, $479, $312.
- **Apex Tool Co. Inc.**, $211, $207, $166.
- **Art Metal Construction Co.**, $331, $331, $215.
- **Atlantic Machine Tool Works Inc.**, $402, $390, $285.
- **Austenal Laboratories, Inc.**, $739, $570, $427.
- **Avco Mfg. Co.**, $103, $103, $61.
- **B. H. Aircraft Co.**, $153, $153, $106.
- **Bendix Aviation Corp.**, $2,657, $2,403, $1,620.
- **Bennett Ireland Inc.**, $56, $56, $36.
- **Besler Corp.**, $72, $51, $41.
- **Bingham-Herbrand Corp.**, $1,022, $1,000, $750.
- **Bonner Machine Works Inc.**, $148, $128, $82.
- **Borg-Warner Corp.**, $2,461, $2,404, $1,418.
- **Leonard Brody Industries**, $210, $103, $77.
- **Canton Drop Forging & Mfg. Co.**, $85, $85, $55.
- **J. C. Carter Co.**, $590, $550, $370.
- **Caval Tool & Machine Co.**, $85, $85, $65.
- **Cell-Form Co.**, $120, $103, $52.
- **Chicago Forging & Mfg. Co.**, $345, $339, $267.

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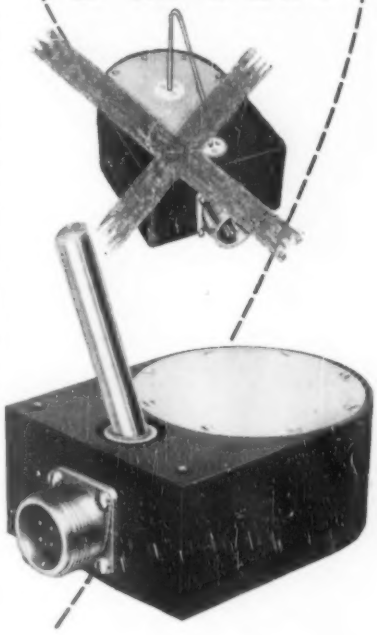

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- **Conn. Filter Corp.**, $183, $182, $91.
- **Continental Aviation & Engineering**, $231, $231, $136.
- **Continental Motors Corp.**, $3,322, $3,322, $2,207.
- **Crawford Door Co.**, $287, $256, $192.
- **Creamery Package Mfg. Co.**, $264, $264, $185.
- **Curtiss-Wright Corp.**, $4,986, $4,520, $2,990.
- **Duco Machine & Tool Co.**, $127, $127, $108.
- **Dana Corp.**, $5,500, $5,460, $4,095.
- **Delavan Mfg. Co.**, $299, $289, $200.
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- **Deutsch Co.**, $107, $107, $80.
- **Dole Valve Co.**, $1,183, $1,100, $715.
- **Dresser Industries Inc.**, $1,357, $1,331, $1,064.
- **Duncan Electric Mfg. Co.**, $51, $51, $38.
- **Eaton Manufacturing Co.**, $2,130, $2,094, $1,571.
- **Electric Engineering Mfg. Corp.**, $114, $114, $74.
- **Charles Engelhard, Inc.**, $71, $53, $37.
- **Ex-Cell-O Corp.**, $5,748, $5,586, $3,934.
- **Fairchild Eng. & Airplane Corp.**, $946, $886, $578.
- **Farmer Bros.**, $468, $393, $295.
- **Federal Machine Tool Co.**, $77, $71, $32.
- **Federal Screw Works**, $368, $368, $239.
- **Firestone Tire & Rubber Co.**, $160, $160, $64.
- **Flexonics Corp.**, $243, $208, $151.
- **Ford Motor Co.**, $9,950, $8,944, $6,107.
- **Garrett Corp.**, $2,414, $2,314, $1,504.
- **Gen. Brass & Machine Works, Inc.**, $53, $53, $40.
- **General Electric Co.**, $90,583, $86,298, $64,717.
- **General Metals Corp.**, $213, $209, $157.
- **General Motors Corp.**, $170,575, $159,823, $104,547.
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- **Hardman Tool & Engineering Co.**, $69, $69, $48.
- **Harris-Seybold Co.**, $625, $625, $406.
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- **Knutsen Machine Prod. Inc.**, $118, $102, $87.
- **Kropp Forge Co.**, $348, $348, $261.
- **Lavelle Aircraft Corp.**, $136, $136, $109.
- **J. Leukart Machine Co.**, $210, $209, $151.
- **Lord Mfg. Co.**, $657, $638, $451.
- **H. W. Loud Machine Works, Inc.**, $395, $271, $187.
- **Luders Marine Construction Co.**, $193, $186, $121.
- **M. B. Manufacturing Co.**, $592, $581, $415.
- **Majestic Machine & Tool Corp.**, $74, $71, $46.
- **Maks Machine Co.**, $121, $116, $68.
- **Manning Maxwell & Moore Inc.**, $191, $188, $131.
- **Marquart Aircraft Co.**, $738, $738, $479.
- **Marquette Metal Products Co.**, $59, $59, $44.
- **Mayfair Industries Inc.**, $104, $104, $83.
- **McCulloch Motors Corp.**, $3,989, $2,606, $2,085.
- **McCurtain Limestone Co.**, $4,931, $4,931, $2,959.
- **McLean Precision Products Co.**, $338, $298, $238.
- **Meisel Press Mfg. Co.**, $136, $136, $105.
- **Metal Spinners Inc.**, $58, $58, $41.
- **Michigan Steel Casting Co.**, $55, $55, $38.
- **Monument Engineering Co., Inc.**, $154, $145, $93.
- **Nasco Inc.**, $238, $238, $143.
- **Nash Kelvinator Corp.**, $9,166, $8,939, $5,730.
- **National Automatic Products Co.**, $72, $70, $50.
- **Neo-Ray Products Co., Inc.**, $84, $84, $58.
- **New Britain Machine Co.**, $2,031, $2,013, $1,429.
- **New England Machine Works, Inc.**, $50, $50, $40.
- **New Process Gear Corp.**, $112, $109, $77.
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- **W. H. Nichols Co.**, $474, $456, $350.
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- **Oneida, Ltd.**, $1,234, $1,234, $802.
- **Pacific Airmotive Corp.**, $88, $88, $57.
- **Packard Motor Car Co.**, $17,599, $17,412, $12,843.
- **Park Drop Forge Co.**, $100, $96, $62.
- **Parker Appliance Co.**, $128, $107, $69.
- **Patterson Products Mfg. Co.**, $87, $87, $69.
- **Peerless Tool and Engineering Co.**, $331, $331, 243.
- **Pierce Governor Co., Inc.**, $241, $195, $153.
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- **Plane Parts, Inc.**, $84, $84, $67.
- **Reda Pump Co.**, $122, $122, $86.
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- **Robertshaw-Fulton Controls Co.**, $1,184, $1,054, $738.
- **Rohr Aircraft Corp.**, $84, $84, $63.
- **Ryan Aeronautical Co.**, $532, $471, $306.
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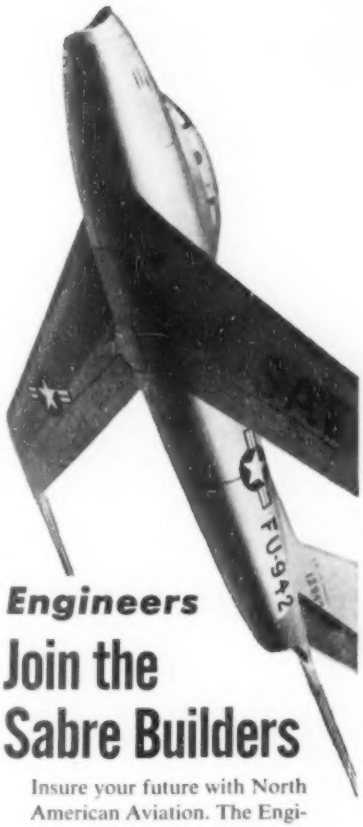
- **Walter E. Schott Co.**, $153, $153, $115.
- **Simmonds Aerocessories, Inc.**, $735, $735, $467.
- **Simplex Piston Ring Mfg. Co.**, $127, $127, $90.
- **Skirvin Tool & Engineering Co.**, $135, $130, $91.
- **Smith Morris Co.**, $319, $318, $219.
- **Solar Aircraft Co.**, $4,597, $4,446, $2,637.
- **South Bend Screw Products, Inc.**, $154, $154, $119.
- **Southworth Machine Co.**, $312, $312, $164.
- **Speed Queen Corp.**, $170, $170, $111.
- **Standard Machine Products**, $75, $75, $34.
- **Steel Improvement and Forge Co.**, $831, $783, $524.
- **Studebaker Corp.**, $3,758, $3,616, $2,712.
- **O. E. Szekely Assoc., Inc.**, $150, $145, $72.
- **Thomas Products, Inc.**, $1,120, $966, $628.
- **Thompson Products Co.**, $12,461, $12,038, $9,507.
- **Towle & Son Co.**, $143, $143, $116.
- **Tube Processing, Inc.**, $127, $124, $87.
- **Tube Turns, Inc.**, $1,386, $1,386, $1,040.
- **United Aircraft Corp.**, $64,415, $63,844, $48,104.
- **United Aircraft Products, Inc.**, $150, $146, $102.
- **United Illuminating Co.**, $470, $466, $93.
- **U. S. Electrical Motors, Inc.**, $1,624, $1,624, $893.
- **United States Rubber Co.**, $1,368, $1,329, $726.
- **United Tool Die Co.**, $88, $88, $62.
- **Utica Drop Forge & Tool Corp.**, $217, $207, $147.
- **Vickers, Inc.**, $2,967, $2,902, $1,886.
- **Vinco Corp.**, $495, $444, $306.
- **Waldorf Instrument Corp.**, $250, $225, $157.
- **Western Automatic Machine Screw Co.**, $714, $714, $464.
- **Westinghouse Electric Corp.**, $31,698, $31,698, $23,095.
- **Willys-Overland Motors, Inc.**, $853, $840, $540.
- **Winters & Crampton Corp.**, $569, $569, $370.
- **Wright Aeronautical Corp.**, $16,780, $16,091, $12,059.
- **Wyman-Gordon Co.**, $7,873, $7,858, $6,136.
- **Yard-Man, Inc.**, $136, $136, $109.
- **The totals, as of June 30, 1953, for manufacturers of aircraft engines and aircraft engine parts are** $549,256, $524,198, $369,032.



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TWIN JETS etch pits in germanium pellet, leaving .0002-in.-thick barrier.

ETCHING AND JUNCTION forming are done in single, easy to control operation.

New Transistor Easy to Mass Produce

By Philip Klass

Philadelphia—Experimental quantities of the basically new "surface barrier" junction transistor recently announced by Philco Corp., should be available to the industry for military applications with a "few months," a company spokesman says. The firm is currently setting up for pilot production of the new device, which can operate at much higher frequencies, uses very low power, and is well suited to mass production (AVIATION WEEK Dec. 21, p. 7).

Philco says the surface barrier transistor has much better performance than previous triode (three-element) junction transistors. Performance is comparable to point-contact and tetrode (four-element) junction transistors, but the new surface barrier type is easier to produce.

▶ **New Transistor Advantages**—Philco claims the following advantages for the new transistors:

• **Higher Frequency Operation.** New units will operate beyond 50 mc. (some have been tested beyond 100 mc.), frequencies heretofore possible only with point contact and tetrode transistors.

• **Higher Gain-Bandwidth.** Surface barrier transistor has a gain-bandwidth product (figure of merit) 50 times larger than junction transistors made by the conventional alloy process, spokesmen say.

• **Lower Power Consumption.** New unit achieves its higher frequency operation with a power consumption only 1/10 to 1/25 as great as point-contact and tetrode transistors, Philco says (an important advantage for avionic use). Collector operating voltage need be only ⅓ to 1/5 as large.

• **Easy to Mass Produce.** Other manufacturing processes employ essentially laboratory-type techniques, limiting quantity and quality of transistor output. New process appears well suited to mass production.

Comparison of transistor noise is difficult since Philco's figures for the new transistor were measured at 10 mc., a higher frequency than noise measurements cited for other types. Transistor noise is usually inversely proportional to frequency.

▶ **Real Significance**—Despite these impressive performance figures, Philco scientists say they have just scratched the surface of the technique's capabilities. They believe the new process opens up entire new areas for exploration. For example, the process makes it possible to construct complex multi-transistor circuits which are infinitesimal compared to present subminiature circuitry. This should be a great boon to digital type computers and communications systems in aircraft, where very large numbers of circuit elements are required.

The new process is called "one of the most important scientific discoveries in solid-state physics," by David B. Smith, Philco vice president in charge of research. In answer to an AVIATION WEEK query, a qualified scientist engaged in transistor research for a leading research laboratory more cautiously termed it "a notable technological advance."

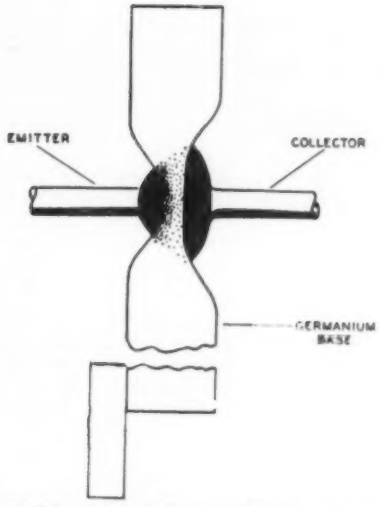
Navy Bureau of Ships, which sponsored a portion of the Philco research program, footed about one-third of the bill, Philco the rest.

▶ **The Unveiling**—The surface barrier technique was unveiled here recently before a joint meeting of the Franklin Institute and the Philadelphia section of the Institute of Radio Engineers. A large and impressive list of semi-conductor experts from most of the major transistor and electronics labs attended at Philco's invitation.

Nation-wide disclosure of the surface barrier transistor followed shortly after the Philadelphia meeting with the publication of five papers, by Philco scientists, in the December issue of the Proceedings of the IRE.

▶ **Old vs. New**—Several techniques are used to manufacture the basic element of the junction transistor, including the alloy-junction, grown-junction, and rate-grown-junction processes. Of these, the alloy process is the most widely used. Two small beads of indium, which become the emitter and collector elements of the transistor, are fused to a tiny germanium base pellet. Then, by a carefully controlled heat treatment, the indium beads are caused to diffuse into the germanium pellet. The problem is to control the penetration of the indium so that only a very thin bridge (of required thickness) of "pure" germanium remains.

A simple analogy, which illustrates the difficulty of controlling the alloy or diffusion process, is to alternately dip the ends of a lump of sugar into a cup of coffee, trying to maintain a thin bridge of white sugar (germanium) between the darkened (indium-germanium) ends. Inasmuch as the actual indium diffusion depth cannot be checked by visual means, to make the



OLDER METHOD for making transistors requires close control over depth of emitter-collector metal diffusion into germanium.

sugar lump experiment more representative, it should be performed blindfolded.

Other processes used to make junction transistors are comparably difficult and demanding in the precision of their control.

▶**Two Innovations**—Philco has introduced two major innovations, the second, originally developed as an outgrowth of the first, is probably more noteworthy in its significance.

• **Fluid Jet Etch:** Two fine streams of etching solution (metallic salt solutions) approximately 0.003-0.004 in. dia., are simultaneously directed against opposite sides of a tiny N-type germanium pellet (approximately 0.05 x 0.1 x 0.006 in.) Applying a potential of several hundred volts between the jets and the pellet, biased in a back direction (germanium serving as the positive electrode) etches small pits on either side of the pellet (see sketch, right). Etching continues until a thin bridge of germanium (barrier) approximately 0.0002 in. thick remains. Philco says it can control the thickness of this barrier to within 0.0001 in., by undisclosed means.

• **Electroplated Junctions:** When the polarity of the voltage applied between the germanium and the jet streams is reversed, metal ions are deposited electroplated in the small etched pits. Philco discovered that by using certain types of metallic salt solutions, such as indium sulphate, the deposited metal beads form a "rectifier type" contact with the germanium, giving good transistor action. One of the beads serves as the emitter, the other as the collector.

In little more than two minutes after the small germanium pellet is inserted in the etching machine, the transistor is completely formed, except for a surface clean-up etch to remove contaminants which might otherwise give a low output impedance. All that remains is to attach leads, mount the element on a base, and hermetically seal it.

▶**Why the Name**—The "surface barrier transistor" is so-named because the transistor action takes place at the surface of the germanium crystal rather than inside. The basic theory to explain surface barrier transistor action has not yet been completely developed. This is not unusual in the new field of semi-conductors where, as one observer put it, "there are many conflicting theories, too little basic understanding."

When Philco hit upon the electrochemical junction forming technique, some of its theoretical physicists did not think it would produce a rectifier-type junction, according to then-existing theory, a representative of the firm confided to AVIATION WEEK. After it was demonstrated that the technique did produce good transistor action, and could be repeated with uniform results, the theorists retired to reinterpret and adjust their basic theories, he added.

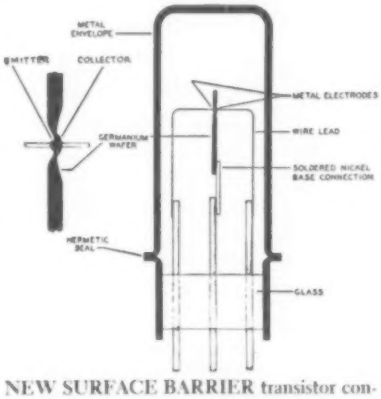
▶**Process Advantages**—From a manufacturing viewpoint, there are several major advantages to Philco's process:

• **Precise Dimensions:** The ability to control the thickness of the germanium barrier with great precision permits construction of very thin barriers. This is directly responsible for transistor's low voltage operation and very high frequency response since the transit time for "holes" (effective current carriers) is proportional to the square of the barrier distance.

• **Easily Controlled:** The entire process, including control of barrier thickness, is directly and easily controlled, simplifying design of automatic production machinery.

• **No Contamination:** The "molecular sawdust" produced by etching is washed away by jet etching streams, continuously keeping germanium surface free of contamination until emitter and collector junctions have been formed.

• **No Structural Damage:** The etching process, which operates only on the top layer of atoms, is gentle on the germanium pellet, prevents damage to its all-important mono-crystalline structure.



NEW SURFACE BARRIER transistor construction, showing close-up of wafer.

Rescue Beacon

To show off the low power consumption of its new development, Philco demonstrated a tiny sea rescue beacon, containing a surface-barrier transistor oscillator, which gets all its power for continuous operation from a battery cell operated by sea (salt) water. The company also showed a tiny transistorized VHF receiver for military use which can operate six hours a day, for six months, on one pair of ordinary flashlight batteries.

The technique can be used with a variety of different metals in addition to indium, including tin, zinc, cadmium, and platinum, Philco says. Some of these materials, like tin, are not presently usable with other types of junction transistor processes.

The company learned early in its experiments that the ambient light around the etching machine affects etching rate because germanium is photo-sensitive. It must therefore be controlled. By making the collector pit slightly larger than the emitter, higher amplification factors (alpha) are obtained.

▶**Typical Transistor Characteristics**—In one of three papers presented at Philadelphia, W. E. Bradley, technical director of Philco research, described the performance characteristics of a random lot of experimental surface barrier transistors. (Collector operated at 3 v., collector current of 0.5 ma.)

Parameter	Typical Value	Range of Values in Group Tested
Alpha	0.9	0.83 to 0.92
Alpha Cutoff Freq.	55 mc.	50 to 60 mc.
Collect. Res. (r_c)	200,000 ohms	145–500,000 ohms
Emitter Res. (r_e)	10 ohms	5 to 25 ohms
Base Res. (Low Freq.)	400 ohms	220 to 1,200 ohms
Base Res. (High Freq.)	170 ohms	50 to 170 ohms
Collect. Capacitance	2.5 mmf.	2 to 4 mmf.
Noise (at 10 mc.)	5 db.	4.8 to 6.5 db.

In another paper, Dr. J. B. Angell reported that one of the new transistors provided 12 db. gain when used as an r.f. amplifier at 55 mc. in a neutralized circuit operated with three volts on the collector. The circuit had 20 db. gain at 30 mc., Dr. Angell said. He also described using one of the new transistors as a mixer. With a 50 mc. signal impressed on the collector, and the local oscillator signal applied to the emitter,

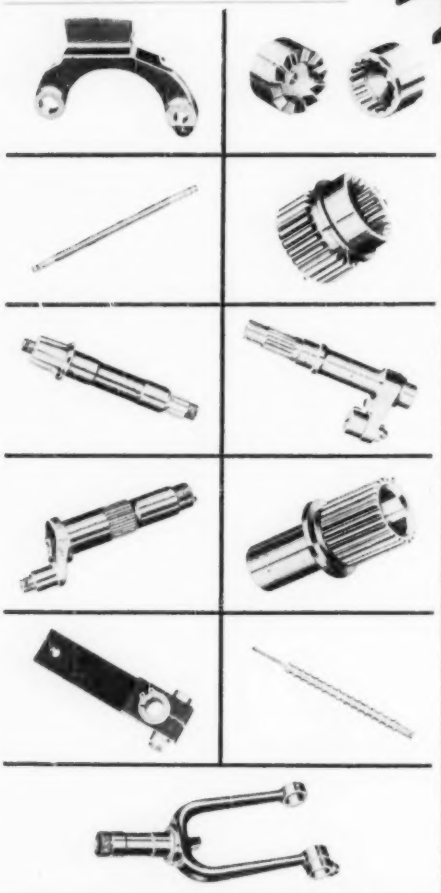
the unit produced an i.f. signal with 12 db. gain, he said. Angell also reported using the device in a bi-stable flip-flop circuit which exhibited a 0.06 microsecond rise time.

▶ **Status**—All surface barrier units produced to date (number undisclosed, but estimated at around 1,000) were made in the laboratory. This limited output was far from adequate to meet demand even within the company, a spokesman says. In addition to its own production plans, Philco is presently considering a plan whereby it would license other manufacturers to use its surface barrier methods.

The company foresees no problem in making the transition from lab to production because of the basic nature of the process. Compared to conventional transistors which Philco has been producing, Smith says the uniformity of surface barrier transistors is "an order of magnitude [ten times] better."

▶ **Hermetically Sealed**—To assure long life, the transistor element is being mounted in a hermetically sealed metal case, approximately ⅛ in. dia. 1 in. long. The case is filled with a heat-conducting compound to bring out internally generated heat to the metal case. From here, a clamp used to mount the transistor to the electronic chassis, will also serve to transfer heat.

GEAR PRODUCTS *designed for flight*



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Tiny Devices to Cut Avionics Load

Several recently announced miniature components may help avionic equipment designers in their continuous battle to reduce equipment size and weight. The new devices:

• **Sealed Relay,** weighing only 3.5 oz. and having a volume of 1.5 cu. in., is available in six-pole, double-throw configuration for operation from 26v. d.c. The new Type M is designed to meet MIL-R-5757 A and B, will operate at temperatures of −65 to 125C. Contact rating is 2 amp. (resistive) and coil resistance is 325 ohms. (Union Switch & Signal division, Westinghouse Air Brake Co., Dept. 67, 1789-1807 Braddock Ave., Pittsburgh 18, Pa.)

• **Sub-Min Amplifier,** for use with piezoelectric, capacitive, or stain-gage-type pick-offs in telemetering or recording circuits, uses ruggedized type WA tubes. New Model 2607 amplifier was initially designed by Endevco Corp. for use with its tiny Series 2200 accelerometer pick-ups. Amplifier has an input impedance of 150 megohms, selectable gain ratio of 10, 30, or 100 and a high gain stability of 3% under varying supply and ambient conditions, manufacturer says. (Endevco Corp., 689 South Fair Oaks Ave., Pasadena, 2, Calif.)

• **Low-Torque Potentiometer,** 0.875 in. dia. operates with a mechanical force as low as 0.015 oz.-in. and is available in single or ganged units, according to Electro-Mec Laboratory, its manufacturer. New Type 9 pots are available in resistances of 50 to 150,000 ohms with standard linearity of 0.5%, or 0.2% if required. Shaft rotations up to 360 deg. and a variety of tapped connections are possible. (Electro-Mec Lab.,

Omni Aid

New Omnimeter, developed by LearCal division of Lear, Inc., for omnirange flying, combines left-right deviation indicator, to-from indicator, and VOR course selector in a single 3½ in. instrument. Omnimeter, now in production, will operate from Lear LTRA-6 VHF receiver/transmiter. Lear says it will continue to build previous cathode-ray tube type of omnirange panel indicator.

21-09 43rd Ave., Long Island City, N. Y.)

• **Resistor-Capacitor Networks,** made by Sprague Electric Co., are now available with dagger-type terminals particularly suited for assembly on printed-circuit type assemblies and dip-soldering techniques. Various types of integrator, diode filter, de-couplings output, and coupling networks are available. (Sprague Electric Co., North Adams, Mass.)

FILTER CENTER

► **AA May Try Selcall**—American Airlines is considering the purchase of one or two prototype Selcall units which Motorola is building to enable interested airlines to try out the new selective calling system (AVIATION WEEK Nov. 16, p. 71). AA's interest stems from the fact that with new remote-control VHF stations used by some Air Route Traffic Control Centers, pilots spend more time monitoring VHF receiver, making it more difficult for company to get the crew on its HF channels.

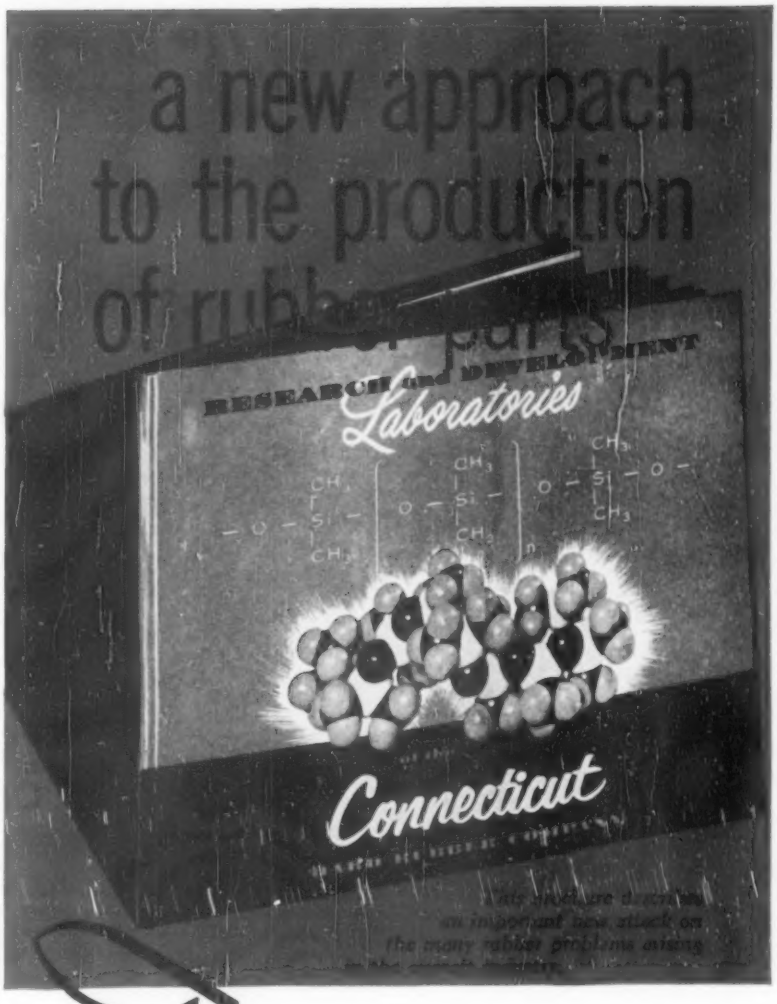
► **NBS Microwave Plans**—Microwave Frequency Standards group of the National Bureau of Standards will soon be instrumented for operation at frequencies of 300 mc. to 75,000 mc., and has future plans to expand to 100,000 mc. and higher.

► **Radio Panels Standards**—Newly established standards for future aircraft radio panels, and the cockpit cavities in which they are installed, are contained in new SC-46 report available from Radio Technical Commission for Aeronautics, 1724 "F" St., N.W., Washington 25, D. C.

► **Narco Demonstrates DME**—National Aeronautical Corp. is making a series of demonstration flights to show off its new DME (distance measuring equipment) to airline operators, business-plane operators, and distributors. Narco says it expects to begin delivery on production model DMEs in January. Unit weighs 28 lb., fits in a ½ ATR case, and is priced at $4,990.

► **Doelcam Opens West Coast Office**—Doelcam Corp. of Boston, which makes gyroscopes and control equipment, has opened a West Coast office at 304 Tejon Place, Palos Verdes, Calif., with George S. Fenn as manager.

► **Ramo-Wooldridge Corp.**—Address of recently formed Ramo-Wooldridge Corp., headed by two former Hughes Aircraft Co. vice presidents, is 6316 W. 92nd St., Los Angeles 45, Calif. —P.K.



THE CONNECTICUT HARD RUBBER CO. is a development organization, with more than one-quarter of its personnel engaged in technical work. This staff has solved many important problems in the rubber and elastomer fields and continues to do so daily. Some of this work is done on a research contract basis. Our achievements in this direction have earned the company an outstanding reputation.

The development skills and know-how gained through this research work are available for the solution of commercial problems and for the production of difficult rubber pieces on a quantity basis.

A copy of this brochure will be sent upon request.

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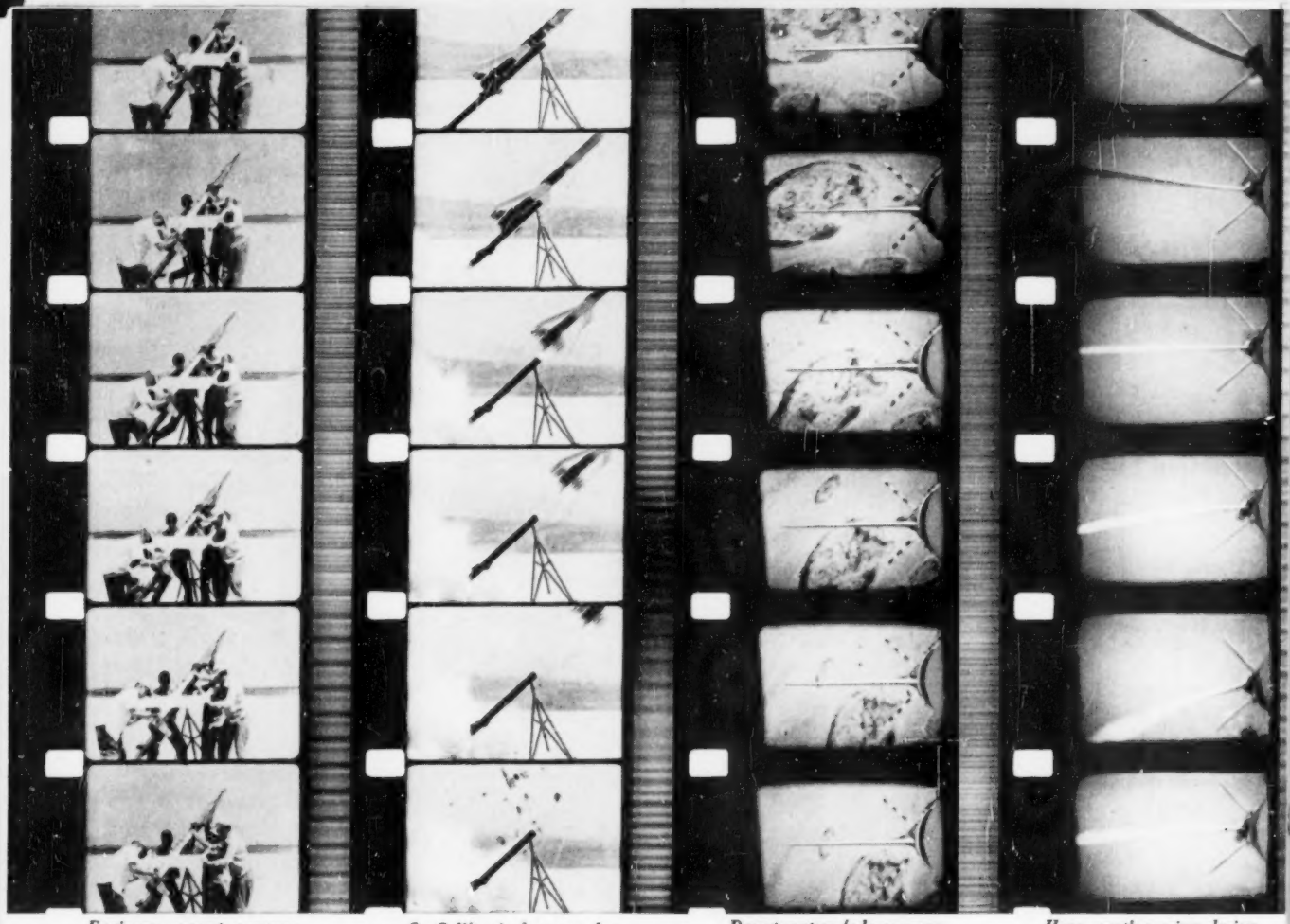


Engineers mount cameras and X-wing on supersonic rocket to test new design.

On California desert, rocket begins flight reaching 3 times the speed of sound.

Desert craters fade away as camera records speed effect on new experimental wing.

Here, another wing design flaps violently from the pressure of the supersonic speed.

Lockheed Scientists Shape the Forms of

Lockheed's Expanding Science Center Improves Today's Planes and Develops New Designs for

FIRST IN THE NATION'S ALL-WEATHER DEFENSE. Lockheed F-94 Starfires are jet interceptors loaded with electronics for almost automatic flight. Starfires protect vital U. S. cities, even in darkness or bad weather. For 8 years, Lockheed has built more jets than any other manufacturer.

Parachuted to earth, rocket camera is recovered with film data vital for the future.

Future Flight

the Era of Automatic Flight

The above film strips take you behind the scenes to show Lockheed scientists testing new wing designs for future aircraft many times faster than today's. This is an example of advanced research at Lockheed's expanding Science Center. Scientist-engineers work with nuclear energy, pilotless aircraft, electronics systems, new metals for the era of automatic flight.

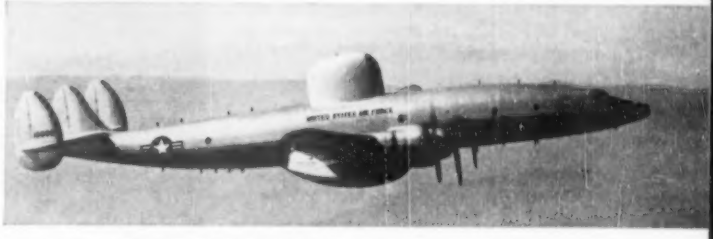
Lockheed discoveries in *pure* science are matched by Lockheed progress in *applied* science. Lockheed's science of design has produced a radar-laden team of protecting military aircraft—flying radar stations, almost automatic interceptors, anti-submarine patrol bombers. Skill in science of production enables Lockheed to produce 12 different models simultaneously—and all models are on schedule!

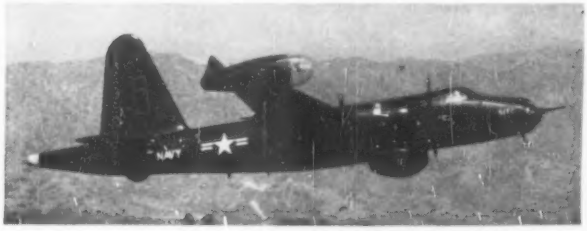
SCIENCE CENTER—*Future forms of flight are studied here in Lockheed's new Engineering and Science Building.*

Announcement

Important news in the U.S. aircraft industry this month was establishment by Lockheed of a new Missile Systems Division, a separate organization integrating 10 years of research and development in the field of electronics and pilotless aircraft. Important progress in current top-secret work at Lockheed prompted decision to establish new division in expanding field of automatic flight.

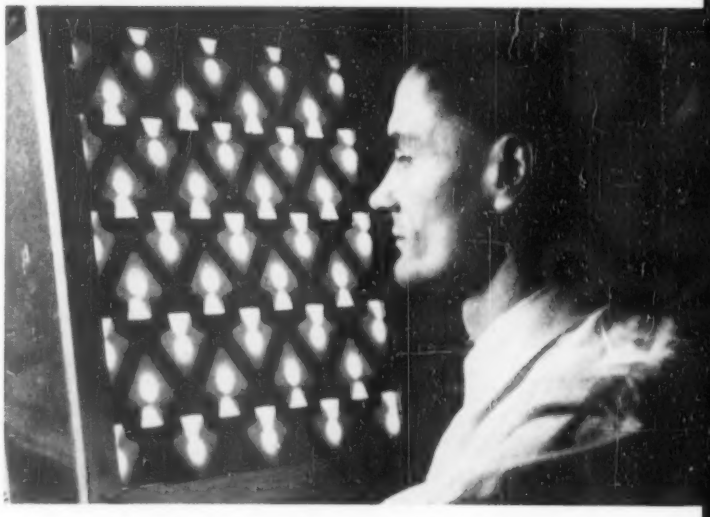
FIRST! FLYING RADAR STATION. Lockheed Super Constellations, with radar humps, provide Navy and U.S.A.F. with new concept of defense—a new method of detecting an enemy hours in advance through applied electronics.





FIRST! ELECTRONIC SUB PATROL—Advanced models of Lockheed P2V Neptune Bombers give U.S. Navy long-range sub patrol with destructive power and advanced sonic devices.

TOMORROW'S METALS. Planes 10 to 25 years from now, currently under study by Lockheed, will require new materials to withstand tri-sonic speeds. Here, Lockheed scientist checks X-ray film of new metal.



COMING SOON—*Look for other dramatic new Lockheed models soon, including XF-104 Day Superiority Fighter.*

Lockheed

Lockheed Aircraft Corporation, Burbank, California, and Marietta, Georgia

LOOK TO LOCKHEED FOR LEADERSHIP

X-3 Cooling System Small but Powerful

By George L. Christian

Bayshore, N. Y.—The cooling system now flying in Douglas' X-3 highspeed research plane represents a completely new, high-efficiency method developed by the Stratos Division of Fairchild Engine & Airplane Corp.

Stratos has incorporated an evaporative heat exchanger with the more-conventional air-cycle refrigeration system and air-to-air heat exchangers to achieve maximum capacity cooling in the smallest space and with the lightest equipment possible.

In everyday terms, this system has the power to cool 24 four-room houses on a 100-deg. day, Stratos says. Yet the weight of its eight components is only about 110-lb.

▶**Highest Requirement**—The X-3 got such high-capacity, compact cooling equipment because it was the first manned aircraft conceived and flown in the U.S. whose design requirements called for sustained flights at high Mach numbers—in the 2.5-3 range.

Although the Douglas Skyrocket is known to have flown at least at Mach 2.01, the entire flight—from launching at 32,000 ft. to making the speed run at 67,000 ft. to dead-stick landing—lasted only some 12 minutes, eight of which were used for the glide home. So refrigeration problems in the Skyrocket were not expected to be nearly so serious as in the X-3.

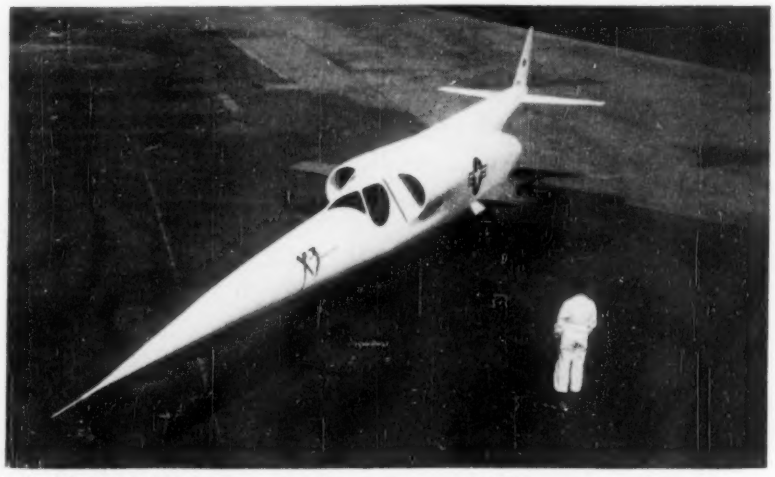
▶**System Operation**—Stratos' evaporative refrigeration system, labeled the EA100, has the highest heat rejection of any airborne air conditioning system in existence, according to the manufacturer.

Dale Moeller, Stratos' chief engineer, is given credit for the system's conception, and directed design and development.

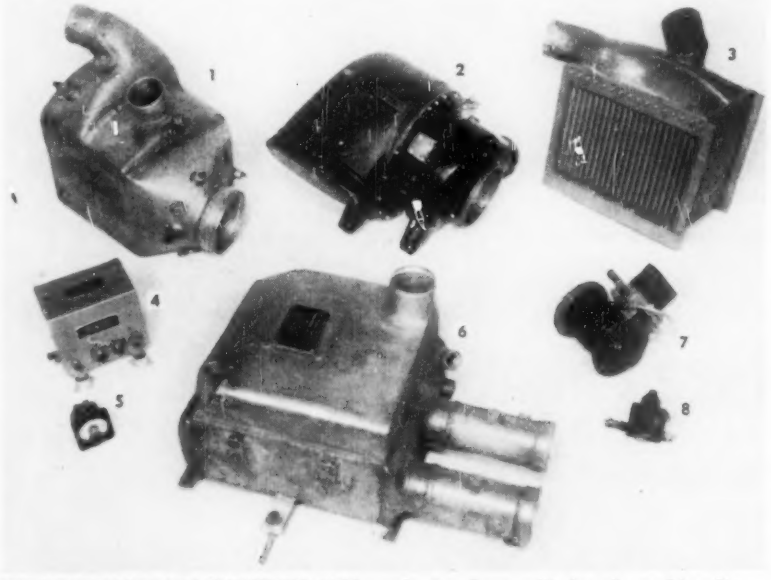
Here is how the EA100 operates:

Air, heated by compression, is bled from the turbojet engines' compressors in conventional manner. Air is passed through a ram air heat exchanger, then through a blower heat exchanger.

But, the ambient air would be so hot due to ram rise at design speed of the X-3, that the temperature drop, even with an efficient air-cycle expansion turbine, would be insufficient to cool the aircraft effectively, Stratos says. That is the reason for adding the evaporative cooling unit, or "boiler." From the boiler, air is spun through the air-cycle cooling turbine, and from there blown into the cockpit.



X-3'S HIGH MACH design speed led to requirement for high-capacity cooling unit.



STRATOS EA100 COMPONENTS: 1) blower heat exchanger; 2) air-cycle machine; 3) ram heat exchanger; 4) tachometer amplifier; 5) tachometer indicator; 6) evaporator; 7) governor control valve; 8) governor control regulator.

In the evaporative cooler, or heat exchanger, water is boiled away at temperatures considerably below 212F, because of the altitude at which the plane is flying. Being an open-cycle device, resultant steam is dumped overboard. Special baffling arrangement keeps water from being siphoned away with the steam. The high efficiency of the system makes it practical to carry the weight and bulk of many gallons of water required to make the system operate, Stratos engineers claim.

▶**More Than the Cockpit**—A problem posed by the X-3's high design speeds is the considerable air temperature rise due to ram. At Mach 2, for example, −67F air will heat to approximately 320F. At Mach 2.5, temperature climbs to about 486F, and at Mach 10 it reaches 9,000F.

So, in the ranges of the X-3's design speed, more than the cockpit needs cooling. The 1,200 lb. of research and

positive valve operation

light weight
compact
multipoised
tight shut-off
low current drain
long life
handles all liquids and gases

METAL SEAT

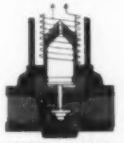
NORMALLY CLOSED
AV-1A

NORMALLY OPEN
AV-2A

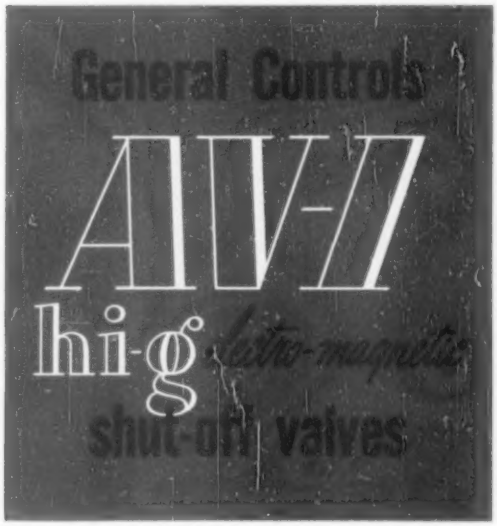
General Controls' AV-1 Series Shut-off Valves control pressurized liquids and gases under extreme vibration and acceleration conditions. Compact and light weight, these multipoised Hi-g valves come normally open or normally closed, with either metal or synthetic seats. Completely sealed-off continuous duty coils allow prolonged energization with extremely low current drain. The *AV-1A* features a disc type armature for positive shut-off under acceleration forces up to 25G. Special units are available for duty up to 300G. The *AV-1B* features a plunger type armature and soft seat, handling virtually all gases and liquids from −65° to 160°F. The General Controls Hi-g family also includes limit controls, 3-way and 4-way selector valves. For complete information send for a copy of Catalog 53G.

SOFT SEAT

NORMALLY CLOSED
AV-1B



NORMALLY OPEN
AV-2B



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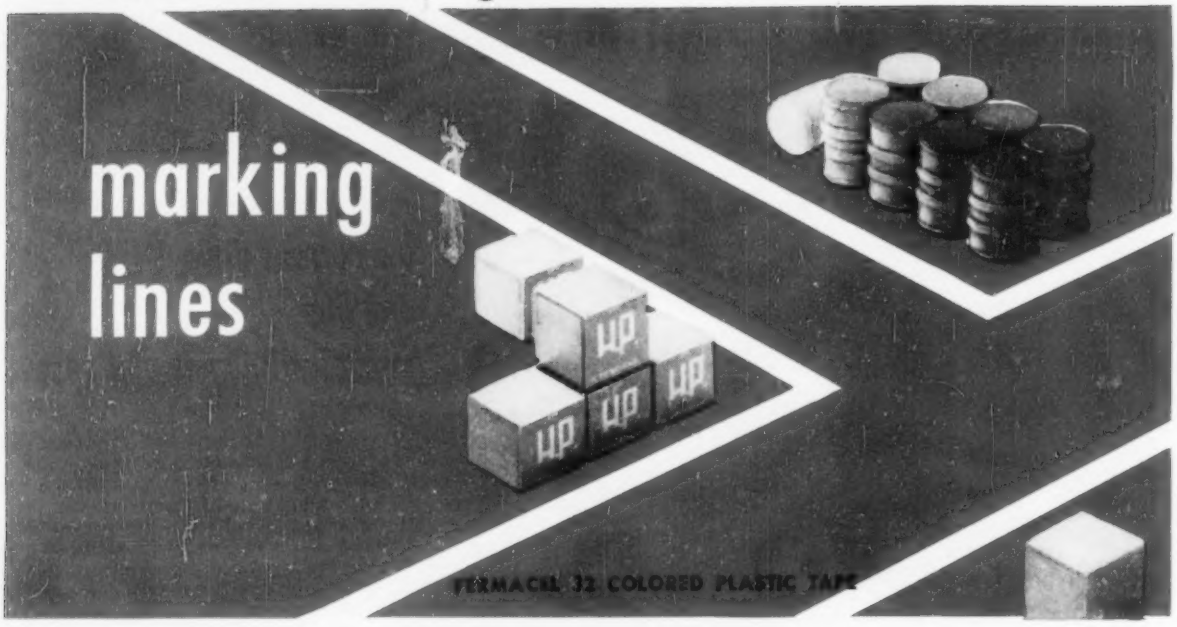
Manufacturers of Automatic Pressure, Temperature, Level and Flow Controls for Heating, Home Appliances, Refrigeration, Industrial and Aircraft Applications.

Whatever the job...



PERMACEL® TAPES

Find out how you can use pressure sensitive tape . . . write Permacel Tape Corporation, New Brunswick, N. J.

avionic equipment (AVIATION WEEK Nov. 23, p. 14), needs to be cooled, as well as the tires and other rubber components such as hydraulic seals.

► **Heat Exchanger**—This new device, which measures some 15x16x16 in. and weighs less than 30 lb., has at least six inlets and outlets, inspection of the unit's photograph shows (p. 56).

Two parallel and adjacent, large-diameter lines extending from the right of the unit appear to be air inlets and outlets. Small line at bottom center may be the water inlet and larger orifice at upper right is probably the steam exit.

Two pipe-thread taps below the steam exit indicate that the heat exchanger is also used to cool some form of liquid besides the air passing through the device. Good bet is the liquid is hydraulic fluid for the plane's main hydraulic system.

► **EA100 Highlights**—Here are some of the highlights Stratos officials cite for their new cooling package:

• **Flexibility.** System was designed to give utmost operating flexibility to meet a wide range of extreme flight conditions. For example, the water evaporator operates automatically only when high demands are put on the system.

• **Energy.** At the X-3's design speed, the system absorbs some 2,600 hp. This figure takes into consideration all factors essential to the entire cooling system. Examples are the additional structure required for the system, fuel needed to carry and operate the system, etc.

• **Dimensions.** Here are some sample sizes of the compact components which make up the EA100 system: Air-cycle machine (turbine), 14$\frac{7}{8}$x12$\frac{3}{4}$x11$\frac{7}{8}$ in.; blower head exchanger, 10$\frac{3}{8}$x17$\frac{7}{8}$x9$\frac{1}{4}$ in.; ram heat exchanger, 14x14$\frac{7}{16}$x8$\frac{1}{4}$ in.; evaporative heat exchanger, 15$\frac{1}{4}$x15$\frac{1}{4}$x16$\frac{7}{16}$ in.

System's maximum air flow is 100 lb./min. and lowest turbine discharge temperature is —40F.

British Develop Jet Runway Compound

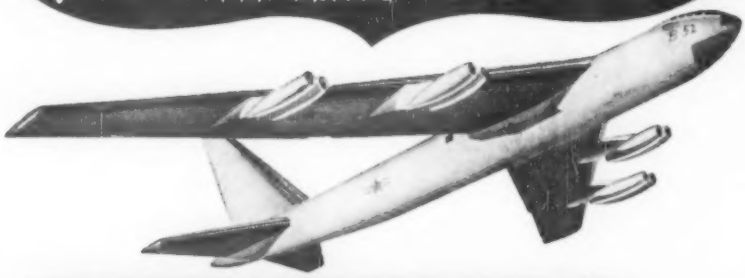
A new composition designed to join concrete slabs of runways used by jet aircraft is being made by Semtex, Ltd., a subsidiary of English Dunlop Co.

The new product, called Semguard Grade J, was developed with a special primer from blends of synthetic resins and rubber with other materials.

Dunlop says the composition has good adherence to concrete, is not affected by jet fuel, can withstand heat of turbine exhausts and does not have a tendency to melt and blow away.

The product, which can be melted at 150-160 deg. and easily poured into the joints, is patented and has been approved by the British Air Ministry.

SSP WEIGHT SAVING
Tapered Tubes
for HEAT DE-ICING APPLICATION



Leaders of Aircraft Industry Select S.S.P. Tapered Tube Ducts

Boeing B-52 engineers demanded tapered tube ducts for DE-ICING application on AMERICA'S biggest, fastest and hardest-hitting bomber. The plane facts are they selected STAINLESS STEEL PRODUCTS tapered tubing—the leading product for the leading edge ducts. S.S.P. tapered tubing saves weight, fits structure better, which means it is possible to put DE-ICING closer to the leading edge, reduces heat losses due to radiation and gives better flow characteristics.

STAINLESS STEEL PRODUCTS, INC.
2958 N. SAN FERNANDO BLVD.
BURBANK, CALIFORNIA

Tapered tubes are but one of STAINLESS STEEL PRODUCTS' family of many dependable engineered products now serving America's Aviation Industry.

ELECTRONICS INSTALLATION DESIGN SUPERVISOR

Supervisory position available on the design staff of a progressive and expanding aircraft company. This appointment involves the responsibility for determining design policy, making major design decisions, and the organizing and direction of a team engaged in the design of radio, radar and electronic systems and installations for a broad field of military aircraft.

Applications are invited from graduate engineers possessing five to ten years' experience in the above field. Experience with modern military aircraft electronics systems is particularly desirable. Experience in the design of equipment is considered an asset and other related experience will be evaluated in the light if its applicability. Reply in detail to

P-1146, Aviation Week
330 W. 42 St. New York 36, N. Y.

Sonnet's NEW Port Contour Cutter Produces the A.N.D. 10050 hydraulic port contour IN ONE PASS!

Cuts job time 3/4! This new special-purpose cutter has four flutes, with each flute designed to perform a separate operation. A single pass of the cutter completes the chamfering, counterboring, radiusing, countersinking and spot facing operations necessary to produce the A.N.D. 10050 hydraulic port or connecting hole. As a result, time required to complete the job is cut approximately 3/4!

Made from alloy-steel, the new tool is hardened for toughness and carbide tipped for long cutting life and smooth finish. Available with either integral or replaceable pilots.

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A. W. HAYDON CO. can't help you –

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you may save time, trouble and money by investigating what our timing engineers have done for others. Our A.C. and D.C. achievements may already include the solution of your most complex problem. Why not find out?

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NEW AVIATION PRODUCTS

Gang Channel Nuts Speed External Tank Assembly

Elastic Stop Nuts in gang channels reportedly reduce time and labor requirements for production and assembly of the Boeing B-47B's external fuel tanks—believed to be the largest that are built. Units are manufactured by Elastic Stop Nut Corp. of America for tanks produced by Ryan Aeronautical Co.

Extensive use is made of gang nut channel strips where assembly joint location is such as to make it impractical for a worker to hold the nuts while bolts are drawn up to make the joint.

With the B-47 fuel tanks, use of nuts prepositioned in channels shaped to fit contours of the joint means that all nuts are automatically positioned when channel is attached, Esna says.

The tanks are constructed in three basic sections. To facilitate shipping and storage, the two tapered end sections can be removed, reversed and nested in cylindrical center section. Joint flanges are inside the tank. Each gang nut channel holds nine nuts and is shaped to cover one-quarter of flange circumference—the joint is made with 36 nuts and bolts.

Manufacturer states that regardless of vibration and stresses encountered in flights, nuts hold joints tight to prevent leakage and structural failure. Tanks are designed to use Esna Type J channels and Type NRG1 nuts. Channels are constructed of high-strength anodized 24S-T4 aluminum, have steel nuts with nylon inserts to protect against attack from fuel.

In operation, bolt and nut are drawn together. Bolt threads impress themselves in nylon collar, which is smaller in diameter than bolt thread. Pressure caused by impressed nylon forces and holds bolt and nut threads into metal-to-

Lockheed in California increases engineering staff

Diversification at Lockheed is resulting in more and better careers for engineers.

Already 12 models of aircraft are in production—huge luxury airliners, cargo transports, jet fighters and trainers, bombers and radar search planes. Already Lockheed's development program is the most diversified in company history.

Now Lockheed is increasing its engineering staff to keep pace with these developments in its expanding long-range program:

1. **new missile division**—Lockheed has established a new division to deal exclusively in design, development and production of pilotless aircraft and their electronic systems. The new division has been organized to meet the approaching era of automatic flight.
2. **nuclear energy**—Lockheed has announced a contract to study nuclear energy applications to aircraft.
3. **advanced fighter**—Lockheed has received a development contract for the highly-advanced XF-104 day supericrity fighter.
4. **new super constellation orders**—New orders for the Super Constellation have increased Lockheed's backlog tremendously. Lockheed now lists 18 airlines throughout the world as Super Constellation customers.
5. **jet transport**—Lockheed is continuing design work on jet transports. Other classified development projects are in progress.

Why Lockheed offers better careers for engineers:

These developments at Lockheed are important to career-conscious engineers.

They mean more career positions are opening up.

They mean you have more scope for your ability.

They mean there is more opportunity for promotion with so many projects in motion.

They mean your future is not limited to any particular type of plane because Lockheed is known for leadership in virtually all fields of aircraft.

They help explain why Lockheed has an unequalled record of production stability year after year.

Lockheed AIRCRAFT CORPORATION

BURBANK, CALIFORNIA

immediate openings for:

aerodynamics engineers
aerodynamicists "A" and "B"
jr. engineers (for aerodynamics work)

thermodynamics engineers
thermodynamicists "A" and "B"
jr. engineers (for thermodynamics work)

In addition, Lockheed's diversified expansion program has created immediate openings for:

design engineers "A" and "B"
flight test engineers
jr. engineers—draftsmen "A" and "B"
process control engineers
service manuals engineers
structures engineers

design specialists
with radar and servomechanisms experience to design flight control and guidance systems for guided missiles

research engineers
with experience in dynamics tests and measurement techniques for research in structural dynamics

research specialists
with extensive experience in micro-wave analysis and development

generous travel allowances

Lockheed invites qualified engineers to apply for these positions. Coupon below is for your convenience.

Mr. E. W. Des Lauriers,
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Dear Sir: Please send me an application form and illustrated brochure describing life and work at Lockheed in California.

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my field of engineering

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To engineers in the Armed Services: you are invited to prepare for the day when you resume your civilian career by contacting Lockheed now.

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Features complete sealing from effects of water, dirt and oils • Vibration resistant up to 240 g's • No resonance up to 7000 C.P.S. • Will take 2000 ft. lbs. shock test • Rated 10 amperes resistive 28 V. D.C. or 115 A.C. • Actuators made to fit individual requirements • Silicone, neoprene or vinyl molded cases • Wire leads from 6 inches to 48 inches optional
CONTROL PRODUCTS • INC
328 SUSSEX STREET • HARRISON • NEW JERSEY
Manufacturers of Thermal Devices and Waterproof Switches

metal contact, creating frictional force to prevent loosening from vibration.

Elastic Stop Nut Corp. of America, Union, N. J.

COMBUSTION CHAMBER cleaner at work on Hiller 12-B engine.

Engine Chamber Cleaner Stretches Overhaul Period

New combustion chamber cleaner is said to provide quick and effective cleaning of combustion chambers of aircraft engines without disassembly.

Operated by air pressure, the new engine service equipment "blasts" a special, hard-grained cleaning agent into the closed cylinder through an adjustable nozzle attached to one of the spark plug ports. Ricochet action within the combustion chamber loosens the carbon and other foreign deposits. Waste materials and deposits are blown out of the cylinder through an adapter attached to the other spark plug port and is returned to a disposable bag. As little as five minutes of cleaning time per cylinder is required.

Restoration of combustion efficiency and reduction of maintenance costs have been demonstrated in use of the machine by aircraft manufacturers and operators, the maker says. The frequent cleaning of the combustion chambers permitted by the device—once every 50 to 100 hours is recommended for lightplanes—is said to allow lengthening time between major overhauls as much as 50%.

Cleaning materials used are not abrasive or corrosive, and leave no harmful residue in the engine.

Developed and manufactured by Kent-Moore Organization, Inc., Detroit, the cleaner is an outgrowth of a machine embodying the same principle which has been used by the automotive industry for several years. It is marketed by Rice-Peterson Sales, Inc., Palo Alto, Calif.

No Room for Industrial Complacency

Do you believe that American industry is equipped with remarkably up-to-date and efficient machinery? If you do, you are mistaken. The fact is that a large share of American industry's equipment is ancient, of obsolete design and incapable of attaining the efficiency that is made possible by modern production techniques.

This fact is documented by the Seventh Inventory of Metalworking Equipment, just completed by AMERICAN MACHINIST, a McGraw-Hill publication. In brief, AMERICAN MACHINIST shows that:

1. More than half (56%) of American industry's most basic production equipment—machine tools and metal-forming units—is overage, and much of it is so old that it has very limited usefulness.

2. Since Korea, the situation has become dangerously worse.

Facts vs. Plausible Theory

These conclusions contradict the widely-held impression that America's industrial equipment is in better physical shape than ever before. The prevalence of this impression is not surprising. We, as a nation, have spent about $125 billion for new industrial plant and equipment since World War II. That is more than in any previous period in our history. During 1953, American industry invested $21 billion in new plant and equipment, an all-time high. From this, it would be reasonable to infer that our industrial plant and equipment must be in fine condition.

But the facts do not support that inference with respect to the machine tools and other metalworking equipment that are so crucial to our economy in war and peace. Here are the key findings of the AMERICAN MACHINIST Inventory:

(1) More than one million machine tools—out of a total of less than two million in the metalworking industries—are at least ten years old. Many of these, after day and night operation

during the war years and the recent rush to rearm, are actually much older production-wise than their age in years indicates. In most cases, these machines are unable to produce goods as efficiently as modern equipment can, thus needlessly increasing costs.

(2) Almost one out of five machine tools is more than twenty years old. Most of these machines are so outdated by modern standards that they have little more than scrap value. And an even larger portion of our metal-forming equipment (presses, brakes and shears, bending and straightening machines) has passed the 20-year mark and is beyond normal retirement age.

(3) Two out of three machine tools are of designs predating World War II, though many of them have been built since the war. Thus, two-thirds of our machine tools fail to incorporate the many major postwar improvements in design and operating methods.

(4) Never before has outmoded high-cost equipment been so widely diffused throughout American industry. In every one of fifteen major divisions of metalworking production, more than 45% of the machine tools are at least ten years old.

(5) Not since the depression days of the 1930's has the average age of machine tools risen so rapidly as it has in the past four years. Today, 55% are ten years old or older, compared with 43% just before Korea.

Quality vs. Quantity

Why has the condition of our metalworking equipment been steadily deteriorating since the end of World War II? Part of the explanation lies in the fact that, in the immediate postwar years, production of metalworking equipment lagged behind the production of industrial equipment generally. The larger part of the explanation, however, lies in the tremendous postwar expansion of the American economy. This expansion, which has more than doubled our total industrial capacity, has imposed requirements for metalworking machinery that have been met only by more extensive use of old and obsolete tools. In the critically important field of metalworking, the job of providing up-to-date tools is bigger than it ever has been.

There are those who argue that the time has come to cut back investment in new industrial plant and equipment and divert more of the national income into current consumption. They cite both the great increase in the nation's total industrial capacity since World War II and the fact that some industries now have more than ample producing capacity to meet their needs. But this type of calculation leaves out the *efficiency* of that producing capacity.

The AMERICAN MACHINIST Inventory makes it manifest that in the key field of metalworking we are alarmingly short of first-rate, low-cost producing capacity. If we fail to remedy this situation by speeding the replacement of obsolete tools, it will be at the peril of our prosperity, at the peril of a sustained increase in our standard of living and of our national security.

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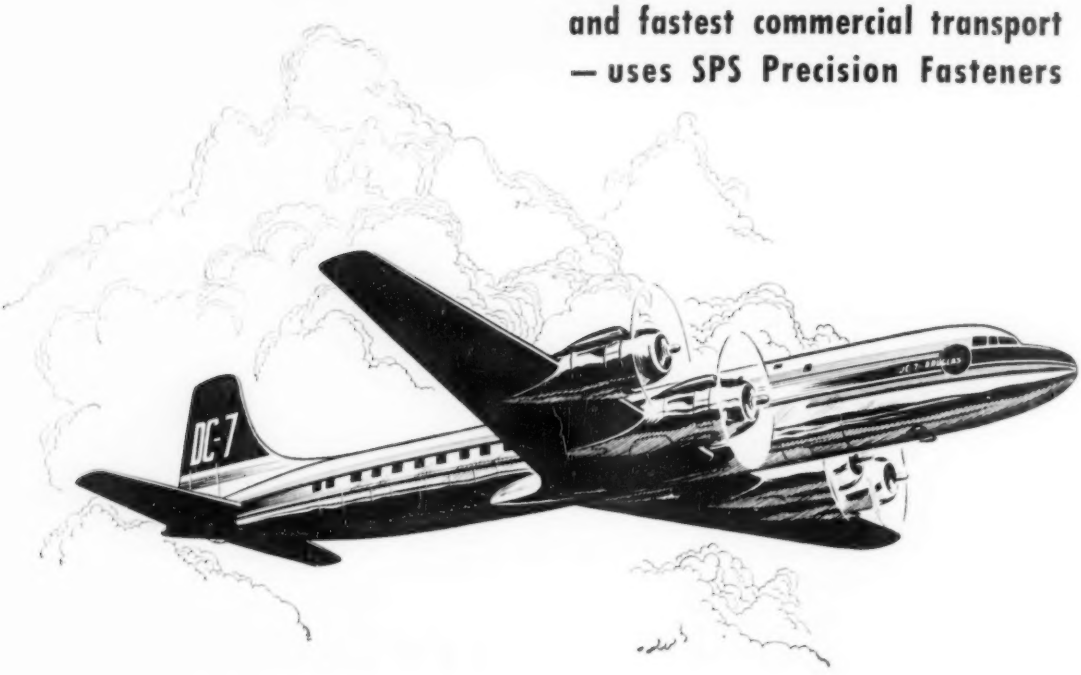

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CAB Rejects Interchange Plan

Reversal of stand on Florida-Texas-West Coast route proposal leaves another avenue open to similar goal.

The Civil Aeronautics Board majority has denied an interchange proposal it originated two years ago to establish competitive southern transcontinental service.

The Board turned down a voluntary Florida-Texas-West Coast through service arrangement of Eastern Air Lines, Braniff Airways and Trans World Airlines. The interchange would have competed with the existing National-Delta-C&S-Continental-American service.

▶**Legal Burden**—Although the legal burden of proof in such cases is on CAB to show the proposal is contrary to public interest, the Board majority this time shifted the burden of proof to the carriers on grounds that Eastern requires a new franchise to link its Tampa and Houston terminals directly.

CAB left the record open for 60 days for EAL to negotiate an interchange with National at New Orleans to accomplish almost the same competitive southern transcontinental service as proposed, but without technically requiring new route authorization for Eastern across the Gulf.

CAB members Josh Lee and Joseph Adams dissented. Adams said the factors that prompted the Board's favorable decision Feb. 11, 1952, on the same question had been strengthened since that decision, which was upset in the courts on a matter of due process of law in the procedural steps leading to the voided ruling.

Adams said Braniff had lost substantial revenue to the National-Delta-Continental-American interchange service and may be forced back on subsidy unless the Board strengthens its system by granting such proposals as the one herein denied.

▶**Majority Reasoning**—Key vote was that of member Chan Gurney, who favored the competitive interchange two years ago. The new majority opinion reasons:

• **Eastern would lose** $304,000 a year on its proposal. Braniff would lose "over $56,000 and TWA would earn only $25,000 a year, and the record now shows that the proposed interchange could not obtain for itself sufficient traffic to meet the expenses of even one daily roundtrip from West Coast to Miami."

• **Present interchange service** of the existing carrier group provides "a minimum of four daily through services and these services offer substantially similar arrival and departure times. . . ."

• **Diversion from other carriers** "would total in excess of $2 million by the applicant's own estimate, and more than $4 million by (CAB) bureau counsel's estimate."

Continental, the subsidized partner in the existing interchange, "would suffer diversion in excess of a quarter of a million dollars annually . . . more than doubling the carrier's dependence upon subsidy mail pay."

• **Civil Aeronautics Act** "imposes upon us the duty to consider as being in the public interest 'competition to the extent necessary,'" but also "requires us to 'foster sound economic conditions.'"

CAB does not "contemplate competition for competition's sake," the Board majority concludes.

Mail Rates Cut

- **Board gives in to P. O. pressure for lower pay.**
- **Six lines reduced to 45 cents on rival routes.**

Civil Aeronautics Board has given in to Post Office Department pressure by slashing the mail rates of two trunklines and revolutionizing the rates of four others.

The six affected airlines flew mail at 53 cents a ton-mile, competing with the Big Four at 45 cents. Post Office recently announced that on Jan. 1 it would fly mail at the lowest competitive rate only, wherever a differential existed on major domestic trunk routes.

Meanwhile, CAB also announced it would study the entire mail-rate structure in light of the impact of this sudden change.

Results of the immediate cuts inaugurated by CAB last week:

• **National and Northwest Orient** rates dropped to 45 cents a ton-mile on all domestic routes. This reduces their 1954 mail revenue, National by $126,000 and NWA by $299,000, CAB estimates.

Such a move had been planned by the Board as far back as 1951. The Post Office move hastened the CAB timing on these two, however. Later growth of the Post Office first-class mail airlift may recoup revenue losses on their major routes.

• **Braniff, Capital, Delta-C&S and Western** may not lose airmail revenue, CAB says, because the Board increased pay on non-competitive routes to offset losses at the 45-cent rate.

Approximate proportions of their mail volume on competitive routes: Capital, 75%; Western, 50%; Delta, 33%; and Braniff 16%. The offsetting non-competitive increases vary in the same proportion. New rates: Capital, 77 cents; Western, 61 cents; Delta, 57 cents; and Braniff, 55.5 cents.

These changes proposed by CAB differ from the petitions of all the affected carriers except Delta. National and Northwest asked higher rates than those proposed. Braniff, Capital and Western actually asked a lower revised rate structure.

The rate changes are in the form of show cause orders, opening the rates as of Jan. 1 but closing them again as soon as the order may be adopted as final. The general mail-rate-structure investigation separately started by CAB at the same time is, in effect, a study.

If the Board decides to overhaul the entire system at a later date as a result of the study, it must follow up with full hearings if parties object to the new proposals.

For this reason, CAB member Josh Lee entered a concurring opinion, saying the review should be in the form of a rate proceeding instead of investigation so the Board could act immediately upon making its findings.

PAA Bids for Inland Air Travel Market

Pan American World Airways hopes to compete more actively for the U. S. interior air travel market when the carrier inaugurates direct service from Chicago and Detroit to Europe Apr. 30 (AVIATION WEEK Dec. 28, p. 7).

PAA has held a franchise on the route since 1945, but a company spokesman says the airline has not operated it in the past because of thinness of the market.

The official attributes Pan American's decision to begin weekly DC-6 service mainly to:

• **Market growth.**

• **Increased PAA capacity.**

• **Air France, Trans World Airlines competition.**

In June, Pan American plans to add direct service to Scandinavia.

TWA already has domestic service through the Midwest.

U.S. Will Continue Weather Ship Support

U. S. support of North Atlantic weather and rescue ships will continue next year, but "on a modified basis."

Air Coordinating Committee has decided to furnish further aid rather than pull out entirely as the U. S. previously indicated it would (AVIATION WEEK Nov. 2, p. 15).

In a letter to International Civil Aviation Organization, Ernest Lister, alternate U. S. representative on the ICAO council writes: "My government has decided to send a delegation to the fourth Atlantic Ocean stations conference in Paris." The meeting is scheduled for next month.

The previous ACC decision, Lister points out, held that "although the program provided real benefit, its continued operation was not required from the point of view of U. S. civil aviation."

"Since that time," he writes ICAO, "the U. S. has noted with interest the views of other governments":

- **Necessary.** "An ocean stations network should continue to exist."
- **Reducible.** "Such a network might be somewhat reduced in scope and still remain useful."
- **Beneficial.** "Substantial benefits accrue to interests other than trans-Atlantic civil aviation, particularly Western Europe."

New York Airports Get New Weather Aids

A $10,760 contract for installation of the first of six end-of-runway weather observation units at Newark, New York International (Idlewild) and La Guardia Airports this spring has been awarded to Lightning Electric Service, Newark, N. J.

The new weather observation program is being established as a result of recommendations made in 1952 by a technical subcommittee of the National Air Transport Coordinating Committee.

Port of New York Authority and NATCC have agreed to share the cost of the Newark transmissometer installation because Weather Bureau funds are not immediately available. The Weather Bureau normally foots the bill for airport weather reporting equipment.

Cost of a ceilometer at the New Jersey terminal is being borne by the bureau. Funds for transmissometer and ceilometer installations at La Guardia and Idlewild are being made available by the Bureau in connection with observation programs conducted at these fields by the Air Navigation Development Board.

International Airline Profits, Revenue and Traffic

	1952	1953	% Change
Revenues:			
Passenger	$212,458,800	$232,226,731	+ 9
Mail and subsidy	51,532,972	55,122,805	+ 7
Cargo	26,818,031	27,746,288	+ 3
Foreign mail	10,188,371	9,603,976	− 6
Total operating revenue	$312,882,962	$336,709,671	+ 8
Total operating expenses	$304,249,554	$312,460,055	+ 3
Operating profits	$8,633,408	$24,249,616	+181
Traffic volume			
Paying passengers	2,362,059	2,650,125	+ 12
Revenue passenger-miles	3,019,810,000	3,356,597,000	+ 11
Mail ton-miles	22,068,132	23,811,161	+ 8
Cargo ton-miles	72,627,275	75,136,265	+ 3
Foreign mail ton-miles	5,644,919	6,216,000	+ 10
Total revenue ton-miles	418,495,928	463,673,220	+ 11

Source: Air Transport Assn. estimates.

Local Service Airline Profits and Revenues

	1952	1953	% Change
Passenger	$19,766,694	$23,329,087	+18
Mail and subsidy	21,334,962	23,832,236	+12
Express	417,244	455,240	+ 9
Freight	405,239	465,991	+15
Total operating revenue	$42,537,500	$48,358,705	+14
Total operating expenses	43,488,500	50,420,460	+16
Operating profit	(−$951,000)	(−$2,061,755)	

Source: Air Transport Assn. estimates.

Flag Line Profits Lead Industry

U. S. international flag lines led the scheduled airline industry to record total operating profits in 1953.

Meanwhile, domestic trunkline profits slipped slightly, Air Transport Assn. believes, and local service carrier losses increased.

Here is the background:

- **International lines** owe most of their profit to final agreement with Civil Aeronautics Board on "fixed" mail subsidy rates, including profit. Most mail and subsidy pay reported for years before 1953 were on a "temporary" break-even basis.
- **Domestic trunklines** may have fallen 1 to 5% short of the 1952 record, but this was partly intentional. They ordered more than 100 new planes for 1953 delivery to expand and improve service—knowing that heavier depreciation charges and lower load factors would squeeze profit margins temporarily.
- **Local service lines** probably will recapture their 1953 losses later through CAB finalization of subsidy rates with the usual 7-8% profit return on investment.

Just as internationals last year won subsidy profits compared with break-even subsidy rates before, most local service lines presumably will receive 1953 profits in some later year when final retroactive rates are set by CAB.

U. S. Airline Profits

(Net operating income in millions)

	1952	1953
Trunklines	$95.1	$92.0
Local service	(−1.0)	(−2.1)
International	8.6	24.2
Total profit*	$102.7	$114.1

Source: Air Transport Assn. estimates.

* Before adjustment for nonoperating income and expenses and for federal income taxes.

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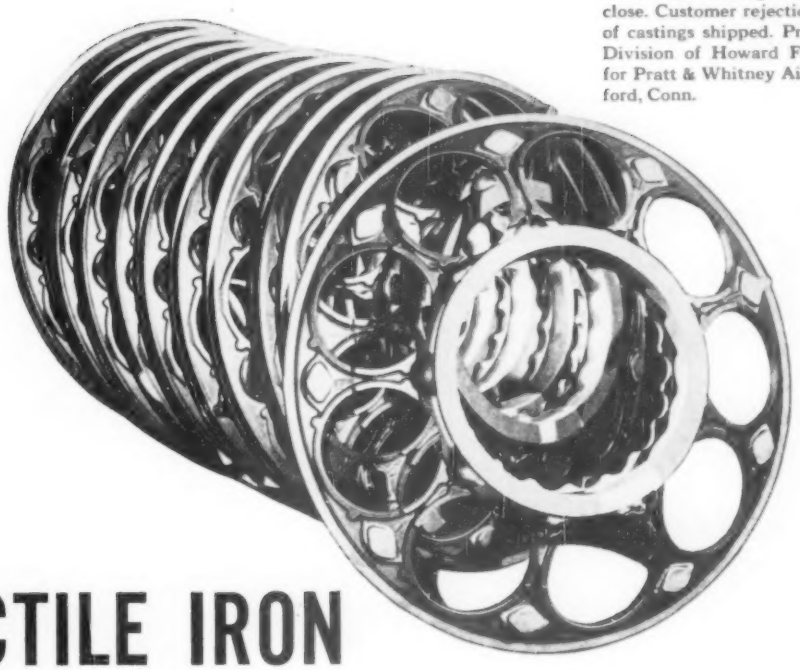

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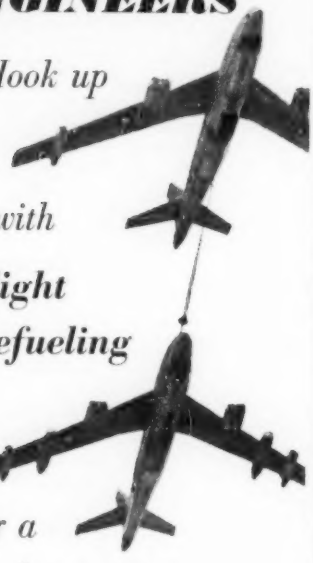

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TAG Reveals AF Supply Routes

Air Force is evaluating proposed freight lift between engine and airframe producers, bases and depots.

Transport Air Group has revealed the routes its member airfreight lines propose to operate between military supply bases, embarkation ports and engine and airframe manufacturers under USAF contract (AVIATION WEEK Dec. 21, p. 18).

The aerial supply plan is similar to Navy's daily transcontinental "Operation Quicktrans" contracted to Flying Tiger Line.

But the TAG proposal contemplates loads that would demand a much bigger operation. It would start with about 25 Curtiss C-46s and Douglas DC-4s and expand by use of government-furnished planes, including Douglas C-118s (DC-6As).

▶**Less Inventory**—TAG's initial program calls for operation between eight Air Materiel Command bases and four ports of aerial embarkation.

Next, the airfreight carriers propose a secondary system operating directly between engine and airframe manufacturers and Tinker AFB, the huge USAF maintenance and overhaul base at Oklahoma City.

This latter plan would bypass the present stage of inventory accumulation at AMC supply depots.

▶**USAF Routes**—The AMC-embarkation route system proposed in the preliminary TAG study, "A Civil Air Arm for a Logistics System":

- **McChord AFB**, Tacoma, Wash., port of embarkation.
- **Travis AFB**, Fairfield, Calif., port of embarkation.
- **McClellan AFB**, Sacramento, Calif., AMC depot.
- **Norton AFB**, San Bernardino, Calif., AMC depot.
- **Hill AFB**, Ogden, Utah, AMC depot.
- **Tinker AFB**, Oklahoma City, AMC depot.
- **Brookley AFB**, Mobile, Ala., AMC depot.
- **Palm Beach** International Airport, West Palm Beach, Fla., port of embarkation.
- **Scott AFB**, Bellville, Ill., AMC depot.
- **Wright-Patterson AFB**, Dayton, Ohio, AMC depot.
- **Olmsted AFB**, Middletown, Pa., AMC depot.
- **Westover AFB**, Chicopee Falls, Mass., port of embarkation.

▶**Manufacturer Routes**—The tentative engine and airframe manufacturer route proposal envisions an aerial supply line for Navy and Air Force aircraft using Pratt & Whitney Aircraft's J57 engine.

These plants comprise the supply chain proposed:

- **P&WA J57 plants** at East Hartford, Conn., and Chicago.
- **McDonnell Aircraft Co.'s F-101 plant** at St. Louis.
- **Boeing Airplane Co.'s B-52 plant** at Seattle.
- **Douglas Aircraft's F4D and A3D factory** at Los Angeles.
- **North American Aviation's F-100 plant** at Los Angeles.
- **Convair's F-102 plant** at San Diego.
- **Tinker AFB**, Oklahoma City, Okla.

▶**Air Force Evaluating**—TAG told AVIATION WEEK that early drafts of its route and operations study proposal already are under study at the offices of USAF Gens. J. L. Riley and J. P. Doyle. Riley is chief of AMC's Transport Division and Doyle is USAF director of transportation.

The airfreight group says Air Force evaluation of supply loads may indicate a need to change the route proposal.

TAG offers to furnish a large part of the planning necessary for USAF to

Air Express by Copter

First shipments of Air Express to be flown by Los Angeles Airways on regular schedule is seen prior to loading at L. A. International Airport Dec. 17. Initially being served are San Bernardino, Van Nuys and Ontario, Calif. (Aviation Week Dec. 21, p. 17), but eventually all points in the LAA system will be included. Shown by the LAA S-55 at the start of the new service, left to right: Railway Express Agency superintendent C. C. Moore, LAA operations manager F. W. Milam, REA foreman H. J. Egger and REA Division supervisor V. V. Fansler.

get maximum use of the proposed service.

Many similar air-logistic proposals have been submitted to USAF by AF offices, Douglas, Convair and others.

Navy has its Quicktrans Operation, but so far no comprehensive air-supply system has been inaugurated by Air Force.

▶ **TAG Organization**—TAG is the association of scheduled and nonscheduled airfreight specialists.

Present membership: California Eastern Airways, Flying Tiger Line, Overseas National Airways, Seaboard & Western Airlines, Slick Airways and Transocean Air Lines.

The carriers report they "have operational jurisdiction over more than 100 cargo-type air transports and carried more than 50% of U. S. domestic airfreight the last three years and 55% of the Pacific airlift volume."

Four members operate large maintenance and overhaul bases, TAG says, with aggregate of more than 500,000 sq. ft. of floor space and more than 1,000 maintenance personnel.

TAG's executive vice president, L. R. Hackney, indicates the proposed operation can match the 11-cent-a-ton-mile cost of the Navy-Flying Tiger operation, assuming that Air Force, like Navy, manages to maintain something near a 98% load factor on the supply operation.

The association proposes to start the AMC and embarkation port route system with 10 DC-4s and 11 C-46s on 20 and 18 flights per day, respectively. Total daily ton-miles would be 324,350, TAG estimates.

CAB Limits Mail Airlift To Certificated Lines

Certificated airmail carriers can handle all business the Post Office Department is giving them, and there is no need to grant special mail exemptions to airfreight and nonscheduled lines, Civil Aeronautics Board rules.

Assistant Postmaster General-Transportation John Allen had asked CAB to grant mail exemptions to certificated airfreighters Flying Tiger Line, Riddle Airlines and Slick Airways.

The cargo carriers and a number of nonskeds had asked the Board for temporary permits to participate in the Post Office's experimental airlift of preferential first-class mail.

Although CAB denies any need or advisability of special exemptions "at this time," the Board says that "with respect to Slick, FTL and Riddle, we are ordering their respective certificate applications . . . set down for hearing at an early date."

▶ **Majority Reasoning**—The Board majority gives these reasons for denying any new competitive mail-carrier exemptions:

• **No undue burden.** CAB says the inability of airfreight lines to obtain mail revenue is no ground for granting the exemption, and the fact that the P.O. mail experiment is temporary does not make a case for a temporary exemption.

• **Certificated interest.** Certificated mail carriers "have an interest in the success of the mail experiment." The Board adds that "the widest possible participation in the mail experiment could so reduce the amount of mail carried by each carrier as to jeopardize the success of the experiment."

• **Adequate capacity.** "The schedules and available space of the certificated mail carriers are more than adequate to handle all Post Office needs."

• **Fitness question.** CAB's majority says "there is a serious question as to the fitness of many of the applicants to perform mail services."

• **Certificated lines.** The Board says applicants have not shown any reason to suspend or change certificates of American, United, Trans World and Capital Airlines—the four carriers operating the Chicago and New York-Washington first-class mail airlift.

• **Requires hearing.** "It would be an abuse of the Board's discretion to issue an exemption without a hearing in view

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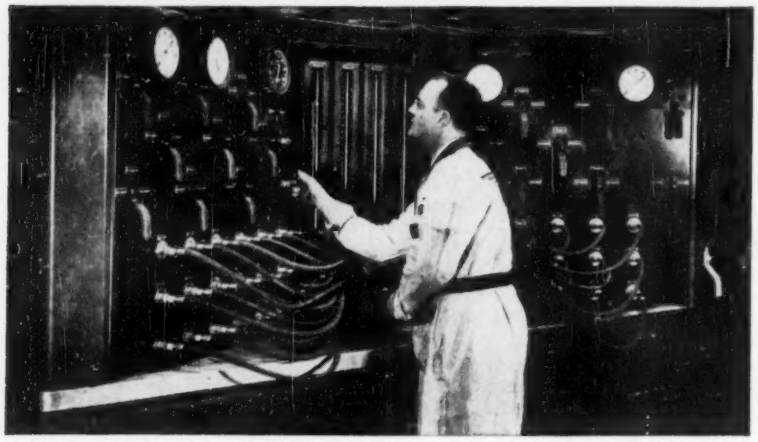

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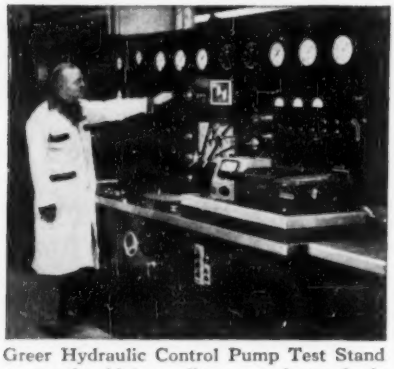

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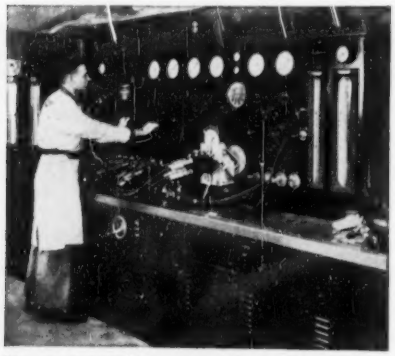

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of the critical issues raised by the applicants' assertions."

► **Concur, Dissent**—CAB members Josh Lee and Joseph Adams say "We concur in the denial of most of the applications herein, but dissent from . . . prohibiting the Flying Tiger Line and Slick Airways from carrying surface mail . . . on the two segments over which the Post Office is conducting its present experiment. . . .

"Since the Postmaster General has requested that participation in this . . . experiment should not be confined to certificated passenger, property and mail carriers, we feel that Slick and the Flying Tiger, who have had applications for mail certificates on file with the Board since May 1, 1952, should be allowed to participate. . . ."

Only member entirely concurring in the Board opinion is Harmar Denny, who held the balance of power in this decision and in a previous ruling that CAB has the legal power to grant mail exemptions "in the public interest" (AVIATION WEEK Dec. 14, p. 114).

Chairman Oswald Ryan and Chan Gurney concur in the Board opinion, but on grounds that CAB does not have power to grant such exemptions.

CAB ORDERS

(Dec. 21-27)

APPROVED:

Air Coach Transport Assn. request to incorporate under the laws of Idaho.

International Air Transport Assn. world passenger and cargo rates agreed to by members at their Honolulu conference.

Capital Airlines continued free transport for technical staff of Bell Telephone Laboratories observing inflight communications.

Holiday mail experimental rate of 30 cents a ton-mile for local service airlines.

GRANTED:

Riddle Airlines exemption to fly "perishable commodities and human remains" between Sarasota-Bradenton, Fla., and New York.

DISMISSED:

Eastern Air Lines request to serve Mobile, Ala., through Keesler Field, Miss., on six to eight flights during holiday rush. Withdrawn by carrier.

Enforcement complaint against Aero Finance Corp., Regina Cargo Airlines and E. J. Averman, Jr., for alleged common control. CAB Office of Compliance moved dismissal following transfer of Averman's Aero voting stock to Wallace F. Peterson, and Averman's resignation of all connection with Aero management.

SUSPENDED:

Pan American World Airways proposed proportional fares and other rate provisions between Seattle and Juneau, Alaska, pending further investigation.

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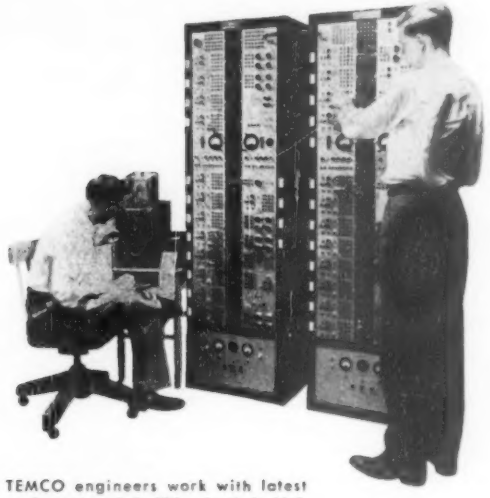

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How Cyclical Is Air Travel?

WHEN YOU LOOK at the way air traffic has been growing in recent years—up and up in almost a straight line—one of the bothersome questions is: What if that growth were interrupted by a drop, as so often happens in other industries? If the future volume of air traffic should turn out to be more cyclical than it has been up to now, a lot of the industry's forward planning, particularly financial planning, would have to be revised.

Business history shows that even growth industries are not completely proof against the effects of business recessions, although the growth trend helps to modify these effects considerably. Take the chemical industry. In recent months, the demand for a good many chemicals has flattened out. Or the oil business: Petroleum economists say they can no longer just project a growth trend, as they did for years. They now allow for cyclical factors. Or if you want a real surprise, look at nylon. Demand for this wonder fiber was supposed to be unlimited. But in 1953, when textiles in general had a slump, consumption of nylon did not increase.

It seems to work this way: In the early stages, some industries grow so fast that their growth trend carries them through general business recessions. But as an industry matures, it's annual gains are less—say 5% to 10%, instead of 20% to 30%. At that point, severe general recession may hold even the growth industry to no gain for a year or so.

Should the airlines worry? Probably not. Air travel still is in a relatively early growth stage. So there is nothing in sight now to indicate an actual drop in traffic. As previous articles in this series have indicated, the long-term trend is up. But in judging **how fast** air travel will increase, it may be a good idea to allow for ups and downs in general business that can affect the growth trend for airlines.

FLUCTUATIONS IN GENERAL BUSINESS

Economists now are pretty well convinced that the American economy has become more stable than it was in the "boom or bust" days of the 1920s and 1930s. No dizzy rise like 1929, and no real depression, is in prospect during the next decade. What is more likely is that we will have business fluctuations of moderate size and relatively short duration. In other words, national income may drop 10% over a period of two years. But it is not likely to drop 25% and stay down for five years.

Quite a number of props have been put under the economy in recent years, to prevent the sort of collapse that occurred in 1929-32. There is insurance for bank deposits, support for farm prices, unemployment insurance, federal loans to distressed business firms, minimum wages for employes—to mention just a few. But there also have been some basic changes in the economy itself that indicate greater stability in the future:

(1) **BUSINESS PLANNING** has improved. Better market research and accounting techniques are helping companies to smooth out inventory fluctuations. New construction does not go up and down as sharply as it used to because more companies are planning their capital expenditures on a long-range basis. And financial policy is more conservative. Fewer firms get deeply into debt.

(2) **THE CONSUMER MARKET** is much broader, and much more stable, than it was 20—or even 10—years ago, because we have had a vast redistribution of income. There are proportionately fewer people in the top and bottom income brackets than there used to be. And there are many more "middle-class" people, with relatively high incomes to spend. This means a much steadier market for all sorts of goods that families buy once they get above the subsistence level. It also means many more families can put savings aside for a rainy day. And it means a large group of them are in the market for luxuries, as well as necessities.

(3) **THE GOVERNMENT** now is committed to fight any business recession with every means at its disposal. And it has the means—tax cuts, public works, easier regulations on lending, and the purchasing power of federal agencies that buy everything from farm products to military equipment. Government action still is cumbersome. And because it starts slowly, it not always is effective immediately. But once under way, largescale federal spending can turn the business tide.

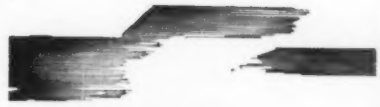
EFFECTS ON AIR TRAVEL

Still there are going to be ups and downs. And they may affect air travel more than was the case in 1938, or 1949. Air travel, like most other "luxury" industries, has been dipping into the middle-class market. This is particularly true of aircoach travel. It is going to be an increasing factor as the airlines carry a higher proportion of pleasure travel, as opposed to business traffic. The very fact that this market has been broadened makes it more vulnerable to slight dips.

On a dip of 5% or 10% in national income, many middle-class families probably will curtail sharply for a year or so on the extra items in their budget: purchases of durable goods, expensive food and clothes—and travel. Not everyone will cut back. And they will not have to stop spending altogether, because (for the reasons given above) cycles are not as severe as they used to be. Since recessions are not likely to last long, travel expenditures will resume their growth trend before long.

But in that "off year" or two, the growth in airlines' business can slow down. The trend in air traffic, over the long pull, will continue up more strongly than general business. And variations around the trend line will be less. But there will be enough general business fluctuations, and enough effects from them, to keep the air transport industry very interested in business forecasting.

Earlier installments Oct. 12 and 19, Nov. 23, Dec. 7 and 21.



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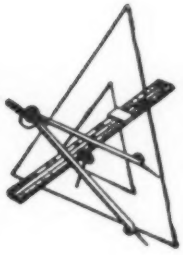

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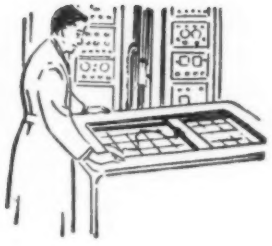

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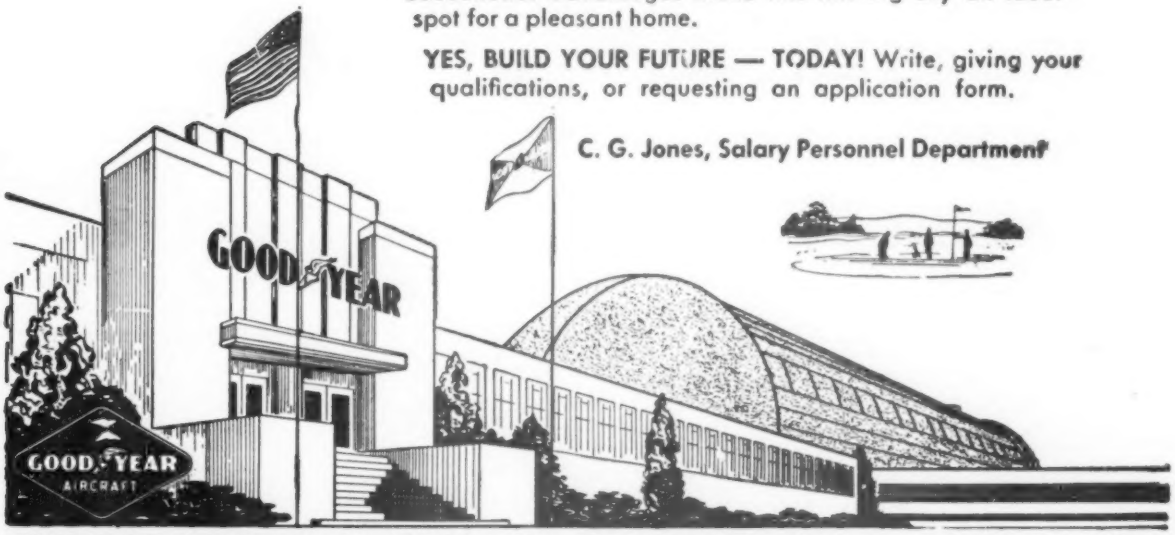

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Tank Unit	Minn. Honeywell	G-1098D	11
Trim Tab Controller	Pioneer	#15701-R	20
Oil Cooler Assembly	U.A.P.	U8416-MM	12
Oil Cooler Assembly	U.A.P.	U8013-MM	14
Hydraulic Pump	Vickers	MF9-713-15H	120
Hydraulic Pump	Vickers	PF12-713-25BCE	124
Hydraulic Pump	Vickers	PF4-713-20BCE	327
Hydraulic Pump/3000 P.S.I.	Vickers	MF45-3911-20Z	43
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CO_2 Cylinders	Kidde	M870036B	47
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Pump	Pesco	2E258SA	21
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Nose Housing	P & W	84591C	77
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Pump Assy.	Wright Aero	420313	33
Drive Assy.	Wright Aero	416421	46
Q.E.C. Unit		FM1	36

AIRCRAFT ENGINES & PARTS (Cont.)

Description	Mfg.	Part No.	Quan.
Q.E.C. Unit		PY4M(B24)	17
Bearing	Torrington	NR6L12	25790
Bearing	Fafnir	AN200-K3L2	18273

GAUGES

Compass	Eclipse	36001-0	20
Gyro Indicator	Eclipse	14601-1F-B1	11
Gyro Indicator	Eclipse	10078-1AG	52
Position Indicator, Wheel & Flap	Weston	AN5780-2	480
Position Indicator, Wheel & Flap	G.E.	AN5780-2	1000
Position Indicator, Wheel & Flap	Eclipse	20100-11C-4-A1	23
Pitch Trim Gauge	Eclipse	15100-1B-A1	19
Cowl Flap Indicator	G.E.	8DJ29AAY	21
Oil Temp. Indicator	Lewis	77C3	23
Oil Temp. Indicator	Lewis	77C4	13
Oil Temp. Indicator	Weston	828TY13Z2	71
Manifold Pressure Gauge	Manning, Maxwell & Moore	AN5770-2	28
Manifold Pressure Gauge	U.S. Gauge (Metric)	AW2-3/4-25K	146
Fuel Quantity Gauge	Eclipse	3801-3B	128
Dual Carb. Temp. Gauge	Weston	828TY12Z2	40
Carb. Air Temp.	Lewis	77C3	22
Carb. Air Temp.	Weston	119862	40
Air Temp. Gauge	Weston	727TY70Z2	11
Air Temp. Gauge	Weston	727TY72Z2	85
Air Temp. Gauge	Weston	727TY73Z2	88
Air Temp. Gauge	Weston	727TY74Z2	83
Air Temp. Gauge	Weston	728-40Z2	10
Air Temp. Gauge	Weston	727-TY37P	298
Air Temp. Gauge	Lewis	47B22	33
Air Temp. Gauge	Lewis	47B23	28
Air Temp. Gauge	Lewis	47B24	54
Air Temp. Gauge	Lewis	47B21	30
Cylinder Head Temp.	Lewis	76B19	8
Torque Indicator	Eclipse	20100-42B-14A2	9
Tachometer Indicator	G.E.	8DJ13ABK	6
Tachometer Indicator	Eclipse	2222-1F-2A	100
Magnesyn Pos. Indicator	Eclipse	20000-8A-14	9
Magnesyn Transmitter	Eclipse	20000-43A-13A1	8
Magnesyn Indicator	Eclipse	23000-2A	67
Pressure Transmitter	Eclipse	22101-11-A4	15
Pressure Transmitter	Giannini	47114-D2.0-20	8
Differential Pressure Gauge	Kollsman	906-6-011	22
Differential Pressure Gauge	Kollsman	254BK-6-052	48

AIRCRAFT (RADIO)

Transmitter	Bendix Radio	TA-12B	20
Receiver	Bendix Radio	RA10-DB	35
Amplifier (PB10) W/ED6 Mount	Eclipse	15401-1	10
Amplifier	Eclipse	12086-1C	11
Radio Noise Filter	G.E.	1C-200	740
Radio Noise Filter	G.E.	NF10084	959
Tube		JAN6AL5	327
Standing Wave Ind.	Hewlett Packard	415A	3
Antenna Switch	Bendix Radio	MS49A	26
Control	Bendix Radio	3616	81
Station Box	Bendix Radio	3620	23
Insulator	Bendix Radio	MT48C	518

ELECTRICAL PARTS

Transformer	Eclipse	DW33	11
Transformer	Eclipse	DW28	80
Transformer	Eclipse	DW47	33
Transformer	G.E.	70G3	26
Servo Motor	Transicoil	#1300-20	57
Motor	G.E.	5BA40NJ1A	425
Motor	G.E.	5DP65-MB1	189
Motor	G.E.	5BA25D-J4B	44
Motor	Airesearch	26675	25
Motor	Diehl	FD65-5	21
Circuit Breaker	Spencer	PM-5	2094

ELECTRICAL PARTS (Cont.)

Description	Mfg.	Part No.	Quan.
Circuit Breaker	Spencer	C6363-1-5A	115
Circuit Breaker	Spencer	C6363-1-2A	115
Circuit Breaker	Heinemann	AM1614-80	1700
Circuit Breaker	Cutler Hammer	6141-H69A	237
Amplidyne	G.E.	5AM31JJ9A	31
Amplidyne	G.E.	5AM31NJ10	111
Switch	Kidde	A-4614	151
Ignition Switch	Scintilla	AN3213-1	70
Ignition Switch	Nesco	A-9(94-3226)	250
Master Switch	Jos Pollack	MB62A	66
Thermo Switch	Fenwall	17322-2	186
Heater Control Switch	White-Rodgers	1033-4E1	987
Air Ram Switch	Minn. Honeywell	PG208AS1	148
Air Ram Switch	Minn. Honeywell	PG208AS7	40
Pressure Switch	Aerotec	M-101-B	90
Pressure Switch	Eclipse	3135-11C	88
Impact Switch	Kidde	SA/3A	18
Switch	C.H.	8909-K99	2000
Dome Light	Grimes	AN3096-4	2585
Dome Light	Grimes	AN3096-5	775
Dome Light	Grimes	AN3096-6	1365
Plug	Cannon	NAF310310-4B	2747
Plug	Cannon	NAF310310-5B	409
Relay	Leach	7264-404	47
Relay	Leach	7210	24
Relay	Allied	BOBX-2	31
Relay	Square D	82A	718
Relay	G.E.	CR2791-G100-K4	281
Relay	G.E.	CR2792F101-A3	626
Relay	Guardian	G34464	41
Relay	Guardian	G31502-A	350
Relay	C. P. Clare	D2060	45
Control Box	Vapor Car Heating Co.	9804B	34
Compensator	Vapor Car Heating Co.	46B311	25
Solenoid	Interstate Aircraft & Eng. Co.	A812	202
Flex. Cable	Airesearch	25432	66
Temp. Control	Fulton Syphon	715E	52
Noise Filter	Mallory	NF3-5	500
Regulator	G.E.	3GBD1A18A	13

VALVES

Valve	Kidde	982585	326
Valve	Oh. Chem.	AN60009-1B	325
Valve	Oh. Chem.	AN60009-2A	247
Valve (3000 PSI)	Parker	2-1046-76	47
Restrictor Valve	Parker	SP4-2746-77	68
Restrictor Valve	Parker	SP4-2746-78	105
Restrictor Valve	Parker	SP4-2746-79	40
Restrictor Valve	Parker	SP4-2746-80	48
Restrictor Valve	Parker	SP4-2746-81	60
Restrictor Valve	Parker	SP4-2746-76	142
Restrictor Valve	Adel	18784	33
Cone Check Valve	Parker	PL2-2546-75	127
Cone Check Valve	Parker	PL2-2546-76	123
Cone Check Valve	Parker	PL2-2546-77	620
Cone Check Valve	Parker	PL2-2546-78	540
Check Valve	Parker	PL7-843-54	112
Check Valve	Parker	PL2-1846-77	23
Check Valve	Kenyon	19100-2-101B	67
Check Valve	Eclipse	557-5	9
Check Valve	U. S. Gauge	AW-CV-1-1	180
Valve	Parker	6-746-10	68
Valve	Vickers	AA31400	28
Restrictor Valve	Adel	18784	33
Lock Valve	Adel	12924-2	85
Brake Valve	Vickers	146102	22
Selector Valve	Parker	SP-1-445-8	7
Selector Valve	Adel	D9530	478
Selector Valve	Adel	D9530-2	668
Selector Valve	Adel	D9560-2	428
Selector Valve	Adel	D9632	179
Selector Valve	Adel	D9696	237
Selector Valve	Adel	D10044	744
Selector Valve	Adel	D10051	244
Solenoid Valve	United	37D6210 (AN4078-1)	2200
Magnetic Valve	General Control	AV1B1174	114
Throttling Valve		73-A-01	1865
Relief Valve	Airex	1265-900	240
Pressure Relief Valve	Aerotec	V301B7	20
Valve	Aero Supply	74247 (TyPH3)	814
Valve	Whittaker	AN5830-1	335
Valve	Whittaker	AN5830-6	74
Valve	Parker	AN5831-1	60
Valve	Eclipse	612-4A	130
Valve	Kohler	K1593-6D	1888
Valve (0-500PSI)	Bendix	146102	46

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SHORTLINES

► **American Airlines** has submitted a bid on four and a half acres of San Francisco Airport land offered by the city's utilities commission as a maintenance site.

► **British Overseas Airways Corp.** will operate Viking airliners in tri-weekly service between Miami and Jamaica, British West Indies, beginning Jan. 16. . . . BOAC commemorated the 50th anniversary of powered flight by making a preliminary jet Atlantic survey flight in a Comet I from London to southwest Ireland.

► **Capital Airlines** settled its annual pay contract with Air Line Pilots Assn. before the Jan. 1 expiration date for the first time in postwar Capital-ALPA negotiations. Minor increases in some wages and benefits were granted.

► **Emery Air Freight Corp.** has expanded its nationwide airfreight forwarding to include Canada and Alaska.

► **Flying Tiger Line** has flown a contingent of 449 Chinese Nationalist military troops from Lindbergh Field, San Diego, Calif., to Norfolk, Va., for training by the U.S. Navy prior to taking over two Navy destroyers for use by the Republic of China.

► **KLM, Royal Dutch Airlines,** has an interline agreement with New York Airways for helicopter passenger service between Idlewild, La Guardia and Newark Airports, the first trans-Atlantic carrier to take this step. . . . Carried 17% more passengers in the first nine months of last year than the first three quarters of 1952. Third quarter shows an increase of 22% over the same period last year. . . . KLM has started twice-weekly service from New York to Tokyo with Super Constellations.

► **Northwest Orient Airlines** set up 50 extra section flights to accommodate its record number of holiday travelers.

► **Pan American World Airways** general counsel, Henry J. Friendly, claims foreign flag airlines have "gobbled up" nearly three-quarters of the business between northeastern U.S. and top Caribbean vacation resorts as a result of the government's delay in permitting American carriers to provide through service to that area.

► **Philippine Air Lines** has received permission to operate weekly service between Hong Kong and Bangkok, connecting with PAL European services at Bangkok. . . . PAL also has been granted "fifth freedom" rights between Rome and Madrid by the Italian government.

► **Sabena Belgian Airlines** has asked Israel's permission to use Lydda Airport as a stop-over in its Brussels-Stanleyville (Belgian Congo) run.

► **Scandinavian Airlines System** claims it pioneered the hauling of first-class mail by air as early as 1928. Today all Scandinavian mail destined for European countries is carried by air in all cases where practical.

► **Trans-Canada Air Lines** will use Bristol Freighters on its regular Montreal-Toronto-Winnipeg service and between New York and Toronto this month.

► **Transocean Air Lines** maintenance department has completed construction of a DC-4E transport at Oakland, Calif. municipal airport, parts of which were found disassembled in storage at Buenos Aires, Argentina.

► **Transportes Aereos Portugueses** (TAP) has started weekly service to Africa, flying DC-4s refitted with Wright Whirlwind engines.

► **Trans World Airlines** has streamlined its teletypewriter communications system. It is as automatic as dial telephoning.

► **United Air Lines** is operating daily nonstop Stratocruiser service between Los Angeles and Seattle in 3 hr. 55 min. . . . UAL is handling 15% more passenger-cargo traffic than at this same time last year.

Air Cargo Lead

Pan American World Airways predicts scheduled U. S. flag lines will dominate the trans-Atlantic air cargo market this year.

PAA will increase its own airfreight capacity by 50% to provide space for a total of 100 million lb. of cargo on routes to Europe, Central and South America and the Far East.

On trans-Atlantic routes, Pan American expects these developments to boost freight flown by U. S. carriers past the present average of more than 40% of the market:

- **Delivery to PAA** of three all-cargo DC-6As, allowing at least two-week U. S.-Europe flights and three "if business requires more."
- **Rate reduction** of 30% for general commodity shipments of more than 400 lb.

AVIATION CALENDAR

Jan. 8-11—Florida Air Pilots Assn., 11th annual air cruise, Miami, Fla.

Jan. 10-12—Institute of Surplus Dealers, trade show and convention, Madison Square Garden, New York.

Jan. 11-15—Society of Automotive Engineers, annual meeting, Sheraton-Cadillac and Statler Hotels, Detroit. American Helicopter Society will present a familiarization program and a symposium on copter fatigue problems Jan. 14.

Jan. 18-22—American Institute of Electrical Engineers, winter general meeting, Hotel Statler, New York.

Jan. 20-22—Operations Research in Production and Inventory Control, Case Institute of Technology, Cleveland. Speakers include Paul Stillson of Lockheed Aircraft.

Jan. 25-28—Plant Maintenance & Engineering Show, International Amphitheater, Chicago. Conference will be held concurrently at the Hotel Conrad Hilton.

Jan. 25-29—Institute of the Aeronautical Sciences, 22nd annual meeting, Hotel Astor, New York. Honors Night Dinner, Jan. 25. American Helicopter Society will present papers on transport and military copter design Jan. 25.

Feb. 1-5—American Society for Testing Materials, 1954 Committee Week with symposium on color of transparent media and design of experiments, Shoreham Hotel, Washington.

Feb. 3-5—Society of Plastics Industry, ninth annual division conference on reinforced plastics, Edgewater Beach Hotel, Chicago.

Feb. 4—Instrument Society of America, ninth annual regional conference, Hotel Statler, New York. Aviation section's papers will include: Afterburner Thrust Measurement in Flight.

Feb. 4-6—Institute of Radio Engineers, sixth Southwestern Conference and Electronics Show, Hotel Tulsa, Tulsa, Okla.

Feb. 18-19—Institute of Radio Engineers and American Institute of Electrical Engineers, transistor circuits conference, Philadelphia.

Feb. 21-23—Third annual Texas Agricultural Aviation Conference, Texas A&M College, College Station, Tex.

Mar. 22-25—Institute of Radio Engineers, national convention, Waldorf-Astoria Hotel and Kingsbridge Armory, New York.

Apr. 5-8—American Management Assn., 23rd National Packaging Exposition, Convention Hall, Atlantic City, N. J.

Apr. 14-16—Society for Experimental Stress Analysis, spring meeting, Netherlands Plaza Hotel, Cincinnati.

Apr. 19-20—Symposium on automatic production of electronic equipment, sponsored jointly by Stanford Research Institute and USAF, Fairmont Hotel, San Francisco.

Apr. 21-24—Second annual student paper competition for undergraduates and graduates, sponsored by the Texas section of IAS, Melrose Hotel, Dallas.

Apr. 22-23—American Institute of Electrical Engineers, conference on feedback control, Claridge Hotel, Atlantic City, N. J.

May 4-6—1954 Electronic Components Symposium, Department of Interior auditorium, Washington, D. C.

May 5-7—Third International Aviation Trade Show, managed by Aircraft Trade Shows, Inc., 71st Regiment Armory, New York.

ADVERTISERS IN THIS ISSUE

AVIATION WEEK—JANUARY 4, 1954

ADVANCE GEAR & MACHINE CORP. 52
Agency—Mack-Wharton Adv.

AERO INSTRUMENT CO. 44

AIRBORNE ACCESSORIES CORP. 8
Agency—Gray & Rogers Adv.

AMERICAN PHENOLIC CORP. 40
Agency—Burton Browne Adv.

BENDIX PRODUCTS DIV.—BENDIX AVIATION CORP. ..... Third Cover
Agency—MacManus, John & Adams, Inc.

CONNECTICUT HARD RUBBER CO. 53
Agency—Peck Brothers Adv.

CONSOLIDATED VULTEE AIRCRAFT CORP. 19
Agency—Buchanan & Co., Inc.

CONTINENTAL MOTORS CORP. 45
Agency—Cummings & Hopkins Adv.

CONTROL PRODUCTS, INC. 62
Agency—George Homer Martin Assoc.

COOK ELECTRIC COMPANY 47

EASTMAN KODAK CO. 24
Agency—J. Walter Thompson Co.

EDO CORPORATION 34
Agency—Davis-Parsons, Inc.

FLIGHT REFUELING, INC. 70
Agency—Davis-Parsons, Inc.

FOOTE BROS. GEAR & MACHINE CORP. ..... Fourth Cover
Agency—The Buchen Company

GENERAL CONTROLS CO. 57
Agency—Hixson & Jorgensen, Inc.

GENERAL SCIENTIFIC CORP. 30
Agency—Irwin Crewshaw

GILFILLAN BROS., INC. 35
Agency—Erwin, Wasey & Co.

GOODYEAR TIRE & RUBBER CO. ..... Front Cover
Agency—Kudner Agency, Inc.

GREER HYDRAULICS, INC. 72
Agency—Dunwoodie Adv. Service

GRUMMAN AIRCRAFT ENGINEERING CORP. 71
Agency—Fuller & Smith & Ross, Inc.

HAYDON CO., A. W. 60
Agency—Cory Snow, Inc.

INDIANA GEAR WORKS 32
Agency—A. L. Perkins & Co.

INTERNATIONAL NICKEL CO. 69
Agency—Marschalk & Pratt Co.

IRON FIREMAN MANUFACTURING CO. 25
Agency—Joseph R. Gerber Co.

LAPOINTE MACHINE TOOL CO., THE 21
Agency—Wells Advertising Agency

LEACH RELAY CO. 37
Agency—The McCarty Co.

LOCKHEED AIRCRAFT CORP. 54, 55
Agency—Foote, Cone & Belding Adv.

LOCKHEED AIRCRAFT CORP. 61
Agency—Hal Stebbins, Inc.

MARTIN CO., THE GLENN L. 23
Agency—Vansant, Dugdale & Co., Inc.

MYCALEX CORP. OF AMERICA 22
Agency—George Homer Martin Assoc.

NEW DEPARTURE DIV., G.M.C. 27
Agency—D. P. Brother & Co., Inc.

NORTH AMERICAN AVIATION 5, 49
Agency—Batten, Barton, Durstine & Osborn, Inc.

O.K. TOOL CO., INC., THE 38, 39
Agency—Peck Brothers Adv.

OMOHUNDRO CO., PAUL 20
Agency—Francis D. Gonda Co.

PASTUSHIN AVIATION CORP. 81
Agency—Lynn-Western, Inc.

PERMACEL TAPE CORP. 58
Agency—The Aitkin-Kynett Co.

PESCO PRODUCTS CO. 65
Agency—The Jayne Organization, Inc.

PLOMB TOOL CO. 4
Agency—Willard G. Gregory & Co.

PROTO TOOLS 4
Agency—Willard G. Gregory & Co.

REF MANUFACTURING CORP. 8
Agency—H. L. Mihic & Co., Inc.

REMINGTON RAND, INC. 10
Agency—Leeford Adv. Agency, Inc.

SEARCHLIGHT SECTION 75, 76, 77, 78, 79

SINCLAIR REFINING CO. 42, 43
Agency—Morey, Humm & Johnstone, Inc.

SNAP-ON-TOOLS CORP. 36
Agency—The Cramer-Krasselt Co.

SOLAR AIRCRAFT CO. 6
Agency—The Phillips-Ramsey Co.

SONNET TOOL & MFG. CO. 59
Agency—Clyde D. Graham Adv.

SPERRY GYROSCOPE CO. 71
Agency—Equity Adv. Agency

STAINLESS STEEL PRODUCTS 59
Agency—Paul & Baum Adv.

STANDARD PRESSED STEEL CO. 66
Agency—Gray & Rogers Adv.

SWEDLOW PLASTICS CO. ..... Second Cover
Agency—Francis D. Gonda Co.

TEMCO AIRCRAFT CORP. 73
Agency—Taylor-Norsworthy, Inc.

THERMO ELECTRIC CO. 33
Agency—Fred Lange Assoc., Inc.

THOMPSON AIRCRAFT TIRE CORP. 41
Agency—Norton M. Jacobs Adv. Agency

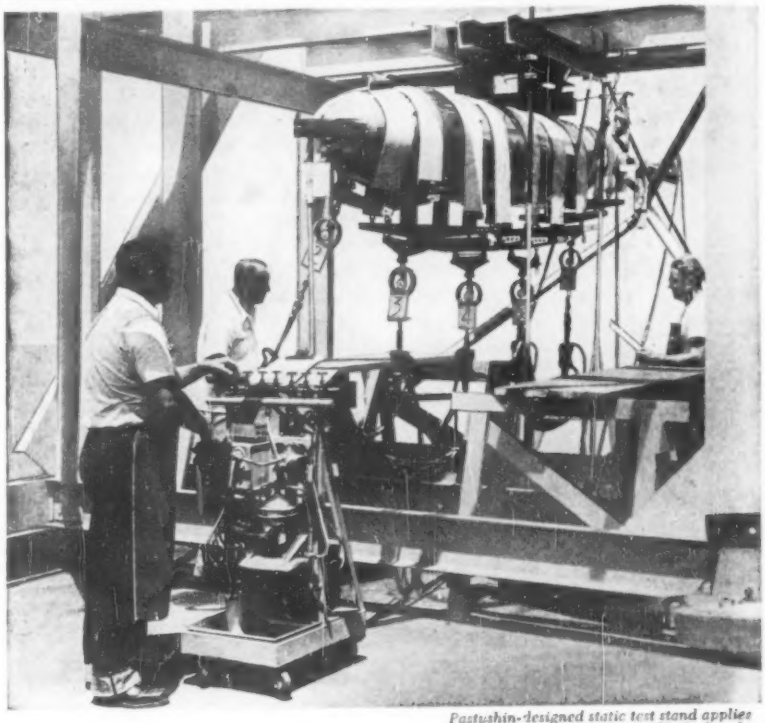
TIMKEN ROLLER BEARING CO. 31
Agency—Batten, Barton, Durstine & Osborn, Inc.

TITEFLEX, INC. 3
Agency—John Falkner Arndt & Co.

WHITTAKER CO., LTD., WM. F. 26, 48
Agency—Megge-Privett, Inc.

SEARCHLIGHT SECTION
(Classified Advertising)
H. E. Hilty, Mgr.

EMPLOYMENT
Positions Vacant 75-77
Selling Opportunities Offered 78
Positions Wanted 76
Selling Opportunities Wanted 75
PROPERTY
For Rent 78
PLANES—EQUIPMENT
(Used or Surplus New)
For Sale 78-79
WANTED
Equipment 78



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EDITORIAL

Municipal Airports Vs. Property Values

Six factual studies in as many metropolitan areas of the United States leave no doubt that, generally speaking, municipal airports do not affect adversely the value of real estate in the vicinity.

This is the conclusion of Herman O. Walther, Chicago realtor and appraiser, who has just completed the most comprehensive survey on this controversial subject that has come to our attention.

Mr. Walther took notice of increasing reports and protests publicized in recent years that airports were depressing value of residential real estate. This opinion was accepted by some lenders of mortgage money, and a few federal agencies restricted insurance and guarantee of home loans in certain areas adjacent to airports, Mr. Walther said.

"In recent years the indictment became stronger and more vocal, but nowhere was there any factual evidence that the airport did actually depress the value of residential real estate. As a matter of fact there was ample evidence of an enigma because if the airport did have such a damaging influence, how could the construction of so many residences be encroaching on the immediate adjacent vacant land?"

Mr. Walther's survey resulted. It included Chicago Midway Airport; Los Angeles International and Lockheed Air Terminal; Denver's Stapleton Field; Dallas' Love Field; Newark, N. J., Airport and La Guardia in Queens, N. Y.

His report is titled, "The Impact of Municipal Airports on the Market Value of Real Estate in the Adjacent Areas."

His major findings, of considerable importance to aviation, were these:

Over 800 double transactions revealed that the market behavior is about the same in airport areas as in areas not in the airport environment.

More than 30,000 buildings (nearly all homes) have been built within a mile of six airports in a 12-year period from 1940.

The number of properties for sale in the airport areas was in most cases less and in a few very slightly more than in comparable areas.

There appeared to be no appreciable difference in market behavior in areas in the path of flight from the other areas.

That airport areas which included homes were in good condition with better than average maintenance.

That trade opinion of real estate brokers active in the areas showed without exception that airports had not influenced the value of homes adversely. Trade opinion of appraisers and mortgage lenders was divided. Some thought that the noise, interference with television and anxiety, produced sales resistance; others did not.

If the noise, interference and anxiety did have any effect on the market behavior, it was offset by amenities which resulted from airports, Mr. Walther found. Some of these amenities may be:

1—Better transportation on account of the airport.

2—Thousands of new employes at the airport strengthens the demand for housing.

3—In many places new industry built near the airport brings more job opportunities.

"In all the communities an effort was made to get trade opinion on the effect of airport activity," Mr. Walther reported. "In every case real estate brokers who had operated in the neighborhoods adjacent to the airports said that the activities of the airport did not affect their business adversely and that they confirmed the findings of our research.

Mr. Walther decided that Chicago Midway was an excellent subject for the beginning of such a study because it holds the claim of the busiest airport in the world, with more than 800 movements a day and more than 5 million passengers a year, employing nearly 7,000 persons. It is comparatively small with one square mile. This means that most of the six runways are less than a mile long. Thus, planes "must contact the runways as soon as possible after reaching the field and this in turn means either that the descent is precipitous or the plane flies lower over adjacent territory." Residential buildings are very close to the ends of the runways. In several areas houses are within 300 to 400 ft., and in no case are they more than a quarter of a mile away.

It seemed obvious that if airports had an adverse effect on the value of adjoining real estate, it would tend to show up conspicuously in a study of the area around Chicago Midway. No such effect materialized.

The number of properties for sale in the Midway Airport section was "conspicuously low," Mr. Walther found. "It appeared therefore that improved residential property in the airport area was not for sale in any great quantity and . . . demand was strong."

It was decided that the amount of new construction in the immediate area was also an indication of the effect of an airport on its community. Mr. Walther discovered that out of about 6,500 homes within a mile of the airport, about two-thirds of them (or 4,300) had been built since 1940, and most of this was after World War II. There were "conspicuous indications that many more buildings would be built in the immediate future."

"Based upon the nature of the market behavior in the area surrounding Chicago Midway Airport as compared to other areas outside of the airport environment, one can come to no other conclusion than that the airport did not affect the value of vicinage real estate adversely," Mr. Walther decided.

Hundreds of homes adjoin Midway Airport, but Mr. Walther noted that the closest homes to Newark Airport, subject of so many accusations in recent years as a nuisance and hazard to citizens on the ground, are at least a mile and a half away. The Newark study dealt with these closest homes in Elizabeth and Newark, as compared with homes in other communities far removed—East Orange and Plainfield.

"All data pointed to the fact that Newark Airport had no unfavorable influence on vicinage real estate," the Chicago appraiser asserted.

Facts—not fiction—indicated the same lack of depressing effect at other airports studied.—**Robert H. Wood**

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